# A MANUAL OF GYNAECOLOGY

BY THE SAME AUTHOR

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## A MANUAL OF MIDWIFERY

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# A MANUAL OF GYNAECOLOGY

BY

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WOMEN TO THE UNIVERSITY OF OXFORD, AND TO THE
ROYAL ARMY MEDICAL COLLEGE

WITH 272 ILLUSTRATIONS IN THE TEXT

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# PREFACE

The object with which this Manual of Gynaecology has been written is to provide for students and general practitioners a complete but not an exhaustive account of the Diseases of Women in their pathological and clinical aspects. The arrangement of the book has been planned rather upon clinical and practical relationships than upon a basis of systematic pathology. Subjects at present imperfectly worked out have been dealt with by eliminating speculative matters, and endeavouring to emphasise such facts as have been credibly established. The sections dealing with Gynaecological Operations are not intended to be exhaustive descriptions of technique; they are given as outlines only, and as they embody the practice and experience of the author it is hoped that they may prove to be of service to those who are beginning the practice of these operations.

Pathological conditions have been illustrated, with few exceptions, from materials taken from the author's own clinical work. Microscopic appearances have been reproduced in drawings made with the aid of microphotographs. Microphotographs themselves are not readily understood by those unfamiliar with histological details, and the present methods of reproducing them are imperfect; consequently their value for purposes of instruction is inferior to that of drawings.

Acknowledgments are due to Masson et C$^{ie}$ of Paris for permission to reproduce certain illustrations from the 'Traité d'Anatomie' of Poirier and Charpy; and to the *Journal of Obstetrics and Gynaecology* in the case of certain illustrations which have appeared in that publication.

My best thanks are also due to Mr. Lionel Provis for his valuable assistance in reading the proofs.

THOS. WATTS EDEN.

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# CONTENTS

PAGE

PREFACE . . . . . . . . . . v

LIST OF ILLUSTRATIONS . . . . . . xv

## PART I

## THE ANATOMY AND PHYSIOLOGY OF THE FEMALE GENITAL ORGANS

- General Anatomy of the Pelvic Cavity . . . . . 1
- The Pelvic Peritoneum . . . . . . . 4
- The Pelvic Cellular Tissue . . . . . . . 8
- The Uterus . . . . . . . . . 11
  - The Endometrium . . . . . . . 16
  - The Musculature . . . . . . . 22
  - The Uterine Attachments . . . . . . 22
  - The Uterus at Different Periods of Life . . . 26
- The Fallopian Tubes . . . . . . . . 28
- The Ovaries . . . . . . . . . 33
  - Histology . . . . . . . . . 35
    - Gräafian Follicle . . . . . . . 37
    - Corpus Luteum . . . . . . . 41
  - The Ovary at Different Periods of Life . . . 44
  - The Parovarium . . . . . . . . 44
  - Physiology of the Ovaries . . . . . . 45
- The Vagina . . . . . . . . . 48
  - The Vaginal Secretion . . . . . . . 50
- The Vulva . . . . . . . . . 51
- The Urethra . . . . . . . . . 58
- Pelvic Blood-vessels, Lymphatics, and Nerves . . . 59
- Development of the Female Genital Organs . . . 67
- Menstruation . . . . . . . . . 71
  - Anatomy . . . . . . . . . 73
  - Symptoms . . . . . . . . . 75
  - Causation . . . . . . . . . 76
- The Menopause or Climacteric Period . . . . 79

## PART II

### METHODS OF EXAMINATION

PAGE
The Previous History . . . . . . . . . 83
The History of the Present Illness . . . . . 83
Abdominal Examination . . . . . . . . 85
Vaginal Examination . . . . . . . . . 90
    Bimanual Examination . . . . . . . . 92
Visual Examination of the Vaginal Walls and Cervix . 97
The Uterine Sound . . . . . . . . . 102

## PART III

### CERTAIN PROMINENT GYNAECOLOGICAL SYMPTOMS

Hæmorrhage . . . . . . . . . . 107
Discharges . . . . . . . . . . 115
Pain . . . . . . . . . . . 118
Disturbances of Micturition . . . . . . . 119
Dyspareunia . . . . . . . . . 122
Sterility . . . . . . . . . . 124

## PART IV

### DISORDERS OF MENSTRUATION

Amenorrhœa . . . . . . . . . . 127
    Primary Amenorrhœa . . . . . . . 128
        Imperforate Hymen . . . . . . 130
    Secondary Amenorrhœa . . . . . . . 134
Dysmenorrhœa . . . . . . . . . . 136
    Spasmodic Dysmenorrhœa . . . . . . 139
    Congestive Dysmenorrhœa . . . . . . 143
Intermenstrual Pain . . . . . . . . . 144

## PART V

### MORBID CONDITIONS OF THE UTERUS

Displacements of the Uterus . . . . . . . 147
    The Normal Uterine Supports . . . . . 147
    Forward Displacement . . . . . . . 153
    Backward Displacement . . . . . . . 155

PAGE
Prolapse of the Uterus . . . . . . . 168
    Cystocele and Rectocele . . . . . 174
  Chronic Inversion of the Uterus . . . . 184
Hypertrophic Elongation of the Cervix . . . . 189
Endometritis . . . . . . . . . . 192
  Acute Endometritis . . . . . . . 194
  Chronic Infective Endometritis . . . . 194
  Chronic Non-infective Endometritis . . . 195
    Corporeal . . . . . . . . 195
    Cervical . . . . . . . . . 200
    Symptoms and Treatment . . . . 206
  Subinvolution and Retention of Products of Conception . . . . . . . . . 208
  Exfoliative Endometritis (Membranous Dysmenorrhœa) . . . . . . . . . . 210
  Senile Endometritis . . . . . . . 213
Chronic Metritis: Fibrosis Uteri . . . . . 215
Fibroid Tumours of the Uterus . . . . . 218
  General Pathological Anatomy . . . . 218
  Subperitoneal Fibroids . . . . . . 224
  Retroperitoneal Fibroids . . . . . . 226
  Interstitial and Submucous Fibroids . . . 227
  Cervical Fibroids . . . . . . . . 231
  Adenomyoma of the Uterus . . . . . 237
  Clinical Features of Fibroid Tumours . . . 240
  Physical Diagnosis . . . . . . . 245
  Secondary changes in Fibroid Tumours . . . 248
  Fibroid Tumours and Malignant Disease . . . 259
  Fibroid Tumours and Pregnancy . . . . 262
  Treatment of Fibroid Tumours . . . . . 265
Uterine Polypi . . . . . . . . . 269
Malignant Growths of the Uterus . . . . . 274
  Cancer of the Cervix . . . . . . 275
    Pathological Anatomy . . . . . . 275
    Clinical Features . . . . . . . 287
      Early Stages . . . . . . . 288
      Advanced Stages . . . . . . 292
    Diagnosis of Operability . . . . . 294
  Cancer of the Body of the Uterus . . . . 296
  Treatment of Uterine Cancer . . . . . 303
  Sarcoma of the Uterus . . . . . . 306
  Chorionepithelioma . . . . . . . 312
Hæmatometra and Pyometra . . . . . . 319

## PART VI

### Morbid Conditions of the Ovaries

PAGE
- Ovarian Neuralgia 321
- Displacements of the Ovary 322
- Hæmatoma of the Ovary 324
- Follicular Cysts 327
- Corpus Luteum Cysts 328
- Cyst-adenomata 330
- Papilliferous Cysts 338
- Racemose Cysts 343
- Cancer of the Ovary 344
- Fibroma of the Ovary 355
- Sarcoma of the Ovary 356
- Endothelioma of the Ovary 358
- Ovarian Dermoids and Teratomata 361
- Cysts of the Parovarium 367
- Secondary Changes in Ovarian Tumours 372
- Clinical Features of Ovarian Tumours 378
  - Benign Cystic Tumours 378
  - Benign Solid Toumours 387
  - Malignant Tumours 388
  - Diagnosis of Secondary Changes 390
- Treatment of Ovarian Tumours 393

## PART VII

### Morbid Conditions of the Fallopian Tubes

- Congenital Abnormalities 395
- Tubal Cysts 395
- Tumours of the Tube 396

## PART VIII

### Pelvic Inflammation

- Etiology of Pelvic Inflammation 402
- Salpingo-oöphoritis 405
  - Changes in the Tube 406
    - Pyosalpinx 411
    - Hydrosalpinx 413
  - Tubal Fistulae 416
  - Changes in the Ovary 417
- Pelvic Cellulitis 420
- Pelvic Peritonitis 421

PAGE
Diagnosis of Pelvic Inflammation . . . . . . 423
Acute Cases . . . . . . . . . 423
Chronic Cases . . . . . . . . 425
Differential Diagnosis . . . . . . . 431
Treatment of Pelvic Inflammation. . . . . . 433
Gonorrhœal Infection . . . . . . . . 436
Tuberculous Disease . . . . . . . . 444
Actinomycosis . . . . . . . . . 449

## PART IX

## EXTRA-UTERINE (ECTOPIC) GESTATION

Ovarian Pregnancy . . . . . . . . 451
Tubal Pregnancy . . . . . . . . 452
Anatomy . . . . . . . . . 453
Tubal Mole . . . . . . . . 455
Tubal Abortion . . . . . . . 460
Tubal Rupture . . . . . . . 461
Clinical Features . . . . . . . . 466
Before Gestation is interrupted . . . . 466
After Internal Bleeding . . . . . . 468
Diffuse Type . . . . . . . 470
Encysted Type (Hæmatocele) . . . . 472
Secondary Abdominal Pregnancy . . . . 477
Treatment of Extra-uterine Pregnancy . . . . 478

## PART X

## MORBID CONDITIONS OF THE VAGINA AND VULVA

Vaginitis . . . . . . . . . . 483
Ulceration of the Vagina . . . . . . . 486
Tumours of the Vagina . . . . . . . 487
Urinary Vaginal Fistulae . . . . . . . 491
Vulvitis . . . . . . . . . . 492
Superficial Atresia of the Vulva . . . . . . 493
Vaginismus . . . . . . . . . . 496
Pruritus Vulvae . . . . . . . . . 500
Eczema . . . . . . . . . 501
Leucoplakia . . . . . . . . . 501
Kraurosis . . . . . . . . . 502
Ulceration of the Vulva . . . . . . . 505
Elephantiasis of the Vulva . . . . . . . 507

PAGE
*Tumours of the Vulva* . . . . . . *509*
*Labial Hernia* . . . . . . . . . . *513*
Bartholinian Cysts . . . . . . . . 513
Perineal Injuries . . . . . . . . . 516
Urethral Caruncles . . . . . . . . 518
Prolapse of the Urethra . . . . . . 519
Carcinoma of the Urethra . . . . . . 521

## PART XI

## MALFORMATIONS

Duplication of the Uterus and Vagina . . . . . 523
Conical Cervix . . . . . . . . . 529
Hermaphroditism and Pseudohermaphroditism . . 530

## PART XII

## MAJOR GYNAECOLOGICAL OPERATIONS

Technique . . . . . . . . . . 533
Ovariotomy . . . . . . . . . 541
Salpingo-oöphorectomy . . . . . . . 544
Conservative Procedures . . . . . 547
Supra-vaginal Hysterectomy . . . . . . 549
Panhysterectomy . . . . . . . . 551
Wertheim's Operation . . . . . . . 553
Myomectomy . . . . . . . . . 556
Vaginal Hysterectomy . . . . . . 558
Ventrifixation . . . . . . . . 563
Shortening the Round Ligaments . . . . . 566

## PART XIII

## MINOR GYNAECOLOGICAL OPERATIONS

Dilatation of the Cervix . . . . . . 569
Curetting . . . . . . . . . . 574
Removal of Polypi . . . . . . . . 577
Trachelorrhaphy . . . . . . . . 579
Amputation of the Cervix . . . . . . 580
Closure of Fistulae . . . . . . . . 583
Perineorrhaphy . . . . . . . . . 587
Anterior Colporrhaphy . . . . . . . 595
Colpotomy: posterior; anterior . . . . . 599

## PART XIV

### AFTER-TREATMENT OF MAJOR OPERATIONS

PAGE
Uncomplicated Cases . . . . 605
Shock . . . . . . 607
Recurrent Hæmorrhage . . . . 609
Intestinal Paresis 610
Peritonitis . 611
Phlebitis . . 612
Intestinal Obstruction 612
Fæcal Fistula . . 612
Stitch Abscess . 613
Sudden Death . . 613

## PART XV

### THERAPEUTICAL NOTE

Vaginal Douching 615
Vaginal Tamponade 617
Vaginal Applications . . 618
Balneo-Therapeutics 620

INDEX . . . . . . . 621

# LIST OF ILLUSTRATIONS

FIG. PAGE
1. Mesial sagittal section through the pelvis of a nullipara . 2
2. Mesial sagittal section through the pelvis of an adult parous woman . . . . . . . . 3
3. Pelvic organs seen from above . . . . . . 5
4. Pelvic organs in sagittal section. . . . . . 7
5. Horizontal section through pelvis to show the cellular tissue . . . . . . . . . . 9
6. Uterus in sagittal section . . . . . . . 12
7. Divisions of the cervix . . . . . . . 13
8. Vaginal surface of cervix (microscopic) . . . 14
9. Normal uterus of a nullipara . . . . . . 15
10. Normal uterus of a parous woman . . . . 16
11. Endometrium of a nullipara (microscopic) . . . 17
12. Normal endometrium of a parous woman (microscopic) 18
13. The glands of the corporeal endometrium (microscopic) 18
14. Section through cervical endometrium (microscopic) . 19
15. The stroma of corporeal endometrium (microscopic) . 20
16. Fibro-muscular layer of uterine wall from a multipara (microscopic) . . . . . . 21
17. Posterior aspect of broad ligament . 23
18. Section through broad ligament showing structures within . . . . . . . . 24
19. Sagittal section of fœtal pelvis seven to eight months' development . . . . . . 26
20. Endometrium after the climacteric (microscopic) . 27
21. The Fallopian tube . . . . 29
22. Transverse section through isthmus of Fallopian tube (microscopic) . . . . . . . 30
23. Ampulla of Fallopian tube bisected (microscopic) . 31
24. Ovary of adult, bisected longitudinally . . . 34
25. Germ epithelium of ovary and tunica albuginea (microscopic) . . . . . . . . 35
26. Cortex of ovary of a child (microscopic) . . . 36
27. Cortex of ovary of an adult (microscopic) . . 37
28. Graafian follicle from ovary of an adult (microscopic) 38

FIG. PAGE
29. Ripening Gräafian follicle (microscopic) . . . . 39
30. Ripening Gräafian follicle protruding upon surface of ovary (microscopic) . . . . . . . . 40
31. Corpus luteum, three weeks after menstruation (microscopic) . . . . . . . . . . 42
32. The ovary of a woman of 56 (microscopic) . . 43
33. The parovarium exposed by dissection of mesosalpinx . 45
34. Longitudinal section through vaginal wall (microscopic) 49
35. The virgin vulva . . . . . . . . . 52
36. The virgin vulva after separation of the labia . . 53
37. The vulva of a multipara . . . . . . . 54
38. Section through the external genital organs . . 55
39. Coronal section showing the relations of urethra, vagina, and rectum . . . . . . . . . 58
40. Arterial blood supply of uterus and vagina. . . 60
41. Relation of uterine artery and ureter . . . . 61
42. General view of lymphatics of female internal sexual organs . . . . . . . . . . 63
43. The uterine lymphatics . . . . . . . 64
44. Vaginal lymphatics and glands to which they pass . 65
45. Diagram of the female type of sexual organs . . 68
46. Diagram representing two stages in development of the cloaca . . . . . . . . . 69
47. Development of external genital organs, eleventh week. 70
48. Development of external genital organs, sixteenth week 71
49. Endometrium of first day of menstruation (microscopic) 73
50. The abdomino-pelvic cavity . . . . . . 87
51. The regions of the abdomen . . . . . . 89
52. The method of making the bimanual examination, at side of couch . . . . . . . . . 92
53. The method of making the bimanual examination, at end of couch . . . . . . . . . 93
54. Ferguson's vaginal speculum . . . . . . 97
55. Method of introducing Ferguson's speculum . . 98
56. Ferguson's speculum after introduction . . . 99
57. Sims's vaginal speculum . . . . . . . 100
58. Sims's position, with speculum introduced . . . 101
59. The uterine sound . . . . . . . . 103
60. Method of introducing the sound, first step . . 104
61. Method of introducing the sound, second step . . 105
62. Hæmatocolpos shown diagrammatically . . . . 131
63. The pelvic diaphragm as seen from above . . . 148
64. The pelvic diaphragm in coronal section . . . 149
65. Anteflexion of the uterus . . . . . . 154
66. The varieties of backward displacement of the uterus. 156
67. Method of digital replacement of retroverted uterus, first step . . . . . . . . . 160

FIG. PAGE
68. Method of digital replacement of retroverted uterus, second step . . . . . . . . 161
69. Method of digital replacement of retroverted uterus, third step . . . . . . . . . 162
70. Use of sound in completing replacement of retroverted uterus . . . . . . . . . . 163
71. Hodge and Albert Smith pessaries . . . . . 164
72. How to hold the Hodge pessary . . . . . 165
73. Method of introduction of Hodge pessary, first step . 166
74. Method of introduction of Hodge pessary, second step 167
75. Procidentia uteri, as seen in mesial sagittal section of pelvis . . . . . . . . . . 170
76. Procidentia uteri, from a dissection . . . . . 171
77. Relaxation of the ostium vaginae in a parous woman . 173
78. The watch-spring ring pessary . . . . . 178
79. How to hold the ring pessary for introduction . . 178
80. Graily Hewitt's cradle pessary for cystocele . . 179
81. The cradle pessary in position in the vagina . . 179
82. The Napier pessary for prolapse . . . . . 182
83. Zwancke's pessary for prolapse . . . . . 183
84. Complete inversion of uterus due to a fibroid tumour attached to fundus . . . . . . . . 185
85. Incomplete chronic inversion of the uterus . . 186
86. Aveling's repositor for chronic inversion . . . 188
87. Hypertrophic elongation of vaginal portion of cervix . 190
88. Complete prolapse with elongation of the uterus . 191
89. Chronic endometritis, glandular variety (microscopic) . 196
90. Chronic endometritis, glandular variety (microscopic) . 197
91. Chronic endometritis, interstitial form (microscopic) . 199
92. Cervical erosion (microscopic) . . . . . . 201
93. The origin of cervical erosion (microscopic) . . 203
94. The origin of cervical erosion (microscopic) . . 204
95. The origin of cervical erosion (microscopic) . . 205
96. Scraping from the uterus in a case of, subinvolution (microscopic) . . . . . . . . . 209
97. Membrane discharged in a case of exfoliative endometritis (microscopic) . . . . . . . 211
98. Complete uterine cast . . . . . . . 212
99. Senile endometritis and pyometra . . . . . 214
100. The formation of submucous and subserous fibroids . 219
101. The formation of polypoid fibroids . . . . 221
102. A section of a hard fibroid tumour (microscopic). . 222
103. Minute structure of a fibroid tumour (microscopic) . 223
104. Capsule of a fibroid tumour (microscopic) . . 223
105. Multiple fibroid tumour . . . . . . 225
106. Large retroperitoneal fibroid tumour . . . 226
107. Sessile submucous fibroid tumour . . . . . 228

FIG. PAGE
108. Uterus containing a large number of submucous fibroid tumours . . . . . . . . . . 229
109. Multiple submucous fibroid tumours . . . . 230
110. Interstitial cervical fibroid tumour . . . . . 232
111. Interstitial cervical fibroid tumour, divided antero-posteriorly . . . . . . . . . 233
112. Cervical fibroid tumour, intra-ligamentary in position. 234
113. Fibroid polypus of the cervix . . . . . . 235
114. Adenomyoma of the uterus, diffuse form . . . 238
115. Adenomyoma of the uterus (microscopic) . . 239
116. Multiple fibroid tumour of the uterus, showing cystic degeneration . . . . . . . . . 252
117. Fibroid tumour, showing myxomatous degeneration (microscopic) . . . . . . . . . 253
118. Cystic fibroid tumour in posterior uterine wall . . 254
119. Large retroperitoneal fibroid tumour, showing cystic degeneration . . . . . . . . . 255
120. Interstitial fibroid tumour with cancer of endometrium . . . . . . . . . . 259
121. Mucous polypus of the cervix (microscopic) . . 269
122. Fibro-adenomatous cervical polypus (microscopic) . 270
123. Fibro-adenomatous cervical polypus (microscopic) . 271
124. Mucous polypus of the uterine body. . . . . 273
125. Cancer of the uterus, showing positions in which the disease may arise . . . . . . . 276
126. Carcinoma of the cervix, in early stage . . . 277
127. Carcinoma of the cervix: proliferative form . . 278
128. Advanced carcinoma of the cervix: ulcerative type . 279
129. Endocervical carcinoma . . . . . . 280
130. Squamous-celled cancer of the cervix (microscopic) . 281
131. Squamous-celled carcinoma of the cervix, showing cell nests (microscopic) . . . . . . . 282
132. Squamous-celled cancer of the cervix, showing ulceration (microscopic) . . . . . . . 283
133. Carcinoma of the cervix, arising in an erosion (microscopic) . . . . . . . . . . 284
134. Adeno-carcinoma of the cervix, tubular form (microscopic) . . . . . . . . . . 285
135. Carcinoma of the body of the uterus . . . 296
136. Papillary carcinoma of the body of the uterus . . 297
137. Adeno-carcinoma of the body of the uterus: tubular form (microscopic) . . . . . . . 298
138. Adeno-carcinoma of the body of the uterus: alveolar form (microscopic) . . . . . . . 299
139. Scraping from a case of carcinoma of the uterine body (microscopic) . . . . . . . . 302
140. Sarcoma of the uterine wall . . . . . . 307

FIG. PAGE
141. Vesicular or grape-like sarcoma of the cervix . . 308
142. Sarcoma of the uterus (microscopic) . . . 309
143. Sarcoma of the uterus, illustrating mode of dissemination (microscopic) . . . . . . . 309
144. Chorionepithelioma of the uterus . . . . 313
145. Chorionepithelioma of the uterus . . . . 314
146. Chorionepithelioma of the uterus (microscopic) . . 315
147. Chorionepithelioma of the uterus (microscopic) . . 317
148. Follicular hæmatoma of the ovary . . . 325
149. Gräafian follicle from an adult ovary (microscopic) . 327
150. Follicular retention cyst (microscopic) . . . 328
151. Wall of a small lutein cyst (microscopic) . . . 329
152. Follicle from normal ovary of an adult (microscopic) . . . . . . . . . . 331
153. Cyst-adenoma of the ovary . . . . . . 332
154. Cyst-adenoma of the ovary (microscopic) . . . 333
155. Cyst-adenoma of the ovary (microscopic) . . . 334
156. Cyst-adenoma of the ovary (microscopic) . . . 335
157. Papilliferous cyst of the ovary (microscopic) . . 337
158. Papilliferous cyst of the ovary . . . . 339
159. Papilliferous cyst of the ovary (microscopic) . . 340
160. Papilliferous cyst of the ovary (microscopic) . . 341
161. Papillary carcinoma of ovary and tube (microscopic) . . . . . . . . . 342
162. Carcinoma of the ovary . . . . . . . 345
163. Alveolar carcinoma of the ovary (microscopic) . . 346
164. Diffuse carcinoma of the ovary (microscopic) . . 347
165. Carcinoma of the Fallopian tube ; secondary to ovarian carcinoma (microscopic) . . . . . . 348
166. Carcinoma of the Fallopian tube (microscopic) . . 349
167. Carcinoma of the Fallopian tube (microscopic) . . 350
168. Papillary carcinoma of the ovary . . . . . 351
169. Papillary cancer of the ovary (microscopic) . . 352
170. Carcinoma of the ovary and uterus . . . . 353
171. Sarcoma of the ovary . . . . . . . 357
172. Endothelioma of the perineum of a dog . . . 359
173. Endothelioma of the perineum of a dog . . . 359
174. Dermoid cyst of the ovary . . . . . . 362
175. Dermoid cyst of the ovary (microscopic) . . . 363
176. Parovarian cyst . . . . . . . . 368
177. Parovarian cyst . . . . . . . . 369
178. Parovarian cyst (microscopic) . . . . . . 370
179. Cysts of Kobelt's tubes . . . . . . 371
180. Ovarian cyst showing axial rotation of the pedicle . 373
181. Large ovarian cyst in a coloured woman . . . 381
182. Hydatid cyst of the Fallopian tube . . . . 397
183. Primary carcinoma of the Fallopian tube . . . 398

FIG. PAGE
184. Primary carcinoma of the Fallopian tube (microscopic) 399
185. Tubo-appendicular fistula . . . . . . 404
186. Chronic salpingitis; from the ampulla of the tube (microscopic) . . . . . . . . . 407
187. Chronic salpingitis (microscopic) . . . . 408
188. Chronic pyosalpinx . . . . . . . 409
189. Chronic pyosalpinx . . . . . . . 410
190. Chronic pyosalpinx . . . . . . . 411
191. Tuberculous pyosalpinx and ovarian abscess . . 412
192. Tuberculous pyosalpinx . . . . . . 413
193. Hydrosalpinx . . . . . . . . 414
194. Chronic salpingo-oöphoritis . . . . . . 418
195. Tubo-ovarian inflammatory swellings (diagrammatic) . 427
196. Tubo-ovarian inflammatory swellings (diagrammatic) . 428
197. Chronic tuberculous salpingitis (microscopic) . . 445
198. Ovarian pregnancy . . . . . . . 453
199. Section through a gravid Fallopian tube . . . 456
200. Tubal mole *in situ* . . . . . . . 457
201. Chorionic villi from a tubal mole (microscopic) . 459
202. Tubal pregnancy, terminating in abortion . . 460
203. Tubal pregnancy of four to five weeks' duration . 461
204. Intra-peritoneal rupture of the tube . . . 462
205. Intra-peritoneal rupture of the tube . . . 463
206. Intra-ligamentary rupture of the tube . . . 464
207. Intra-ligamentary rupture of the tube . . . 465
208. Tubal abortion with hæmatosalpinx . . . 467
209. Decidual cast from a case of extra-uterine gestation (microscopic) . . . . . . . . . 469
210. Pelvic hæmatocele shown in mesial sagittal section . 475
211. Cyst of the anterior vaginal wall . . . . . 488
212. Superficial atresia of the vulva in an adult. . . 494
213. Superficial atresia of the vulva after operation . . 495
214. The incision for cases of vaginismus . . . 497
215. Operation for vaginismus . . . . . . 498
216. Vaginal dilator . . . . . . . . 499
217. Leucoplakia (microscopic) . . . . . . 503
218. Elephantiasis of the vulva . . . . . . 508
219. Squamous-celled carcinoma of the vulva (microscopic) 510
220. Malignant melanoma of the vulva . . . . 511
221. Bartholinian cyst . . . . . . . . 514
222. Papillomatous form of urethral caruncle (microscopic) 519
223. Acute prolapse of the urethral mucous membrane . 520
224. Uterus didelphys . . . . . . . . 524
225. Uterus bicornis bicollis . . . . . . . 525
226. Uterus bicornis unicollis . . . . . . . 526
227. Uterus septus. . . . . . . . . 527
228. Uterus subseptus . . . . . . . . 528

FIG. PAGE
229. Uterus unicornis, with an imperfectly developed second cornu . . . . . . . . . . 529
230. Ovariotomy trochar . . . . . . . 542
231. Pozzi's abdominal retractor . . . . . . 545
232. Treatment of pedicle in salpingo-oöphorectomy. . 546
233. Ligaturing the pedicle in sections after tube and ovary have been removed . . . . . . . . 546
234. Author's modification of Wertheim's vaginal clamp . 554
235. Uterus and upper end of vagina held in vaginal clamp . . . . . . . . . . . 555
236. Worrall's broad ligament needle for vaginal hysterectomy . . . . . . . . . 560
237. Vaginal hysterectomy: transfixing the base of the broad ligament . . . . . . . . . 560
238. Vaginal hysterectomy: opening the utero-vesical peritoneal pouch . . . . . . . . . 561
239. Band of adhesion resulting from ventrifixation of the uterus . . . . . . . . . . 565
240. Retro-peritoneal shortening of the round ligament; Gilliam's operation . . . . . . . 567
241. Retro-peritoneal shortening of the round ligaments; Gilliam's operation . . . . . . . 567
242. Auvard's self-retaining vaginal speculum . . . 570
243. Auvard's speculum in position . . . . 571
244. Vulsellum forceps . . . . . . . . . 572
245. Uterine dilators . . . . . . . . . 572
246. Dilatation of the cervix . . . . . . 573
247. Laminaria tent and tent forceps . . . . 574
248. The flushing uterine curette . . . . . . 575
249. Obstetric laceration of the cervix . . . . 579
250. Amputation of the cervix, first step . . . 580
251. Amputation of the cervix, second step . . . 581
252. Amputation of the cervix, third step . . . 582
253. Elevated pelvic position for operation for vesico-vaginal fistula . . . . . . . . . 584
254. Knives for vesico-vaginal fistula . . . . . 584
255. Operation for vesico-vaginal fistula . . . . 585
256. Flap-splitting operation for vesico-vaginal fistula . 586
257. Complete perineal laceration . . . . . . 588
258. Angled scissors for perineorrhaphy . . . . 589
259. Perineorrhaphy for complete laceration . . . 590
260. Perineorrhaphy for complete laceration . . . 591
261. Perineorrhaphy needles . . . . . . . 593
262. Perineorrhaphy for complete laceration . . . 594
263. Anterior colporrhaphy, first step . . . . 596
264. Anterior colporrhaphy, second step . . . . 597
265. Anterior colporrhaphy, third step . . . . 598

FIG. PAGE
266. Flat vaginal retractor . . . . . 599
267. Posterior colpotomy . . . . . . . 600
268. Martin's pelvic trochar . . . . . 601
269. Anterior colpotomy . . . . . . . 602
270. Arbuthnot Lane's apparatus for subcutaneous saline transfusion . . . . . . . . . 608
271. Vaginal tampons for local applications . . . 618
272. Probe for intra-cervical applications . . . 619

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# MANUAL OF GYNAECOLOGY

## PART I

## THE ANATOMY AND PHYSIOLOGY OF THE FEMALE GENITAL ORGANS

### GENERAL ANATOMY OF THE FEMALE PELVIC CAVITY

The true pelvic cavity forms the lowest part of the general abdominal or peritoneal cavity, and is limited above by the brim of the pelvis, below by the pelvic diaphragm. Within this cavity, and invested more or less completely by the peritoneum, lie the bladder, the uterus, the Fallopian tubes, the ovaries, and the upper part of the rectum; the lowest part of the great or gastro-colic omentum, some coils of the ileum, and a loop of the pelvic colon also form part of its normal contents. It is further to be borne in mind that in a certain proportion of cases the vermiform appendix overhangs the pelvic brim, and lies in close relation to the right ovary and to the outer part of the right Fallopian tube. Piercing the pelvic diaphragm to open upon the perineum are the urethra, the vagina, and the rectal ampulla with the anal canal; these parts lie below the level of the peritoneal reflection, and represent respectively the urinary, genital, and intestinal tracts. A mesial sagittal section through the normal pelvis shows the general relation of the more important organs to one another (figs. 1 and 2). Immediately behind the pubes lies the bladder, separated from the bone by a little loose and very vascular connective tissue. The urethra appears as a narrow channel which runs in its upper one-third directly downwards, and in its lower two-thirds curves downwards and forwards to end at the meatus urinarius. Behind the bladder lies the uterus; these organs are separated from one another

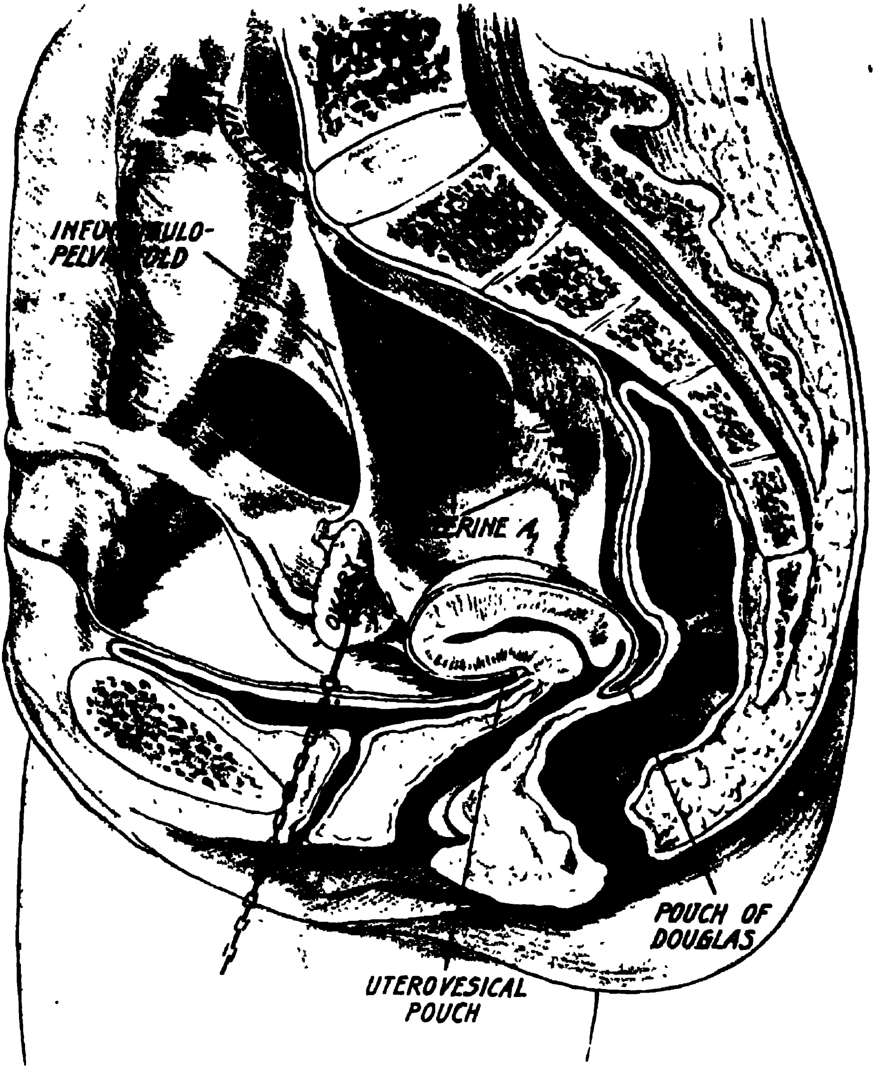

FIG. 1.—MESIAL SAGITTAL SECTION THROUGH THE PELVIS OF AN ADULT NULLIPARA (Poirier).

by a reflection of the peritoneum, but below the level of this reflection they are united, over a small area, by cellular tissue. The vagina runs downwards and forwards to end at the vulva ; it is united by a variable amount of cellular tissue to the bladder and urethra in front, and to the anterior rectal wall behind. The lower third of the anterior vaginal

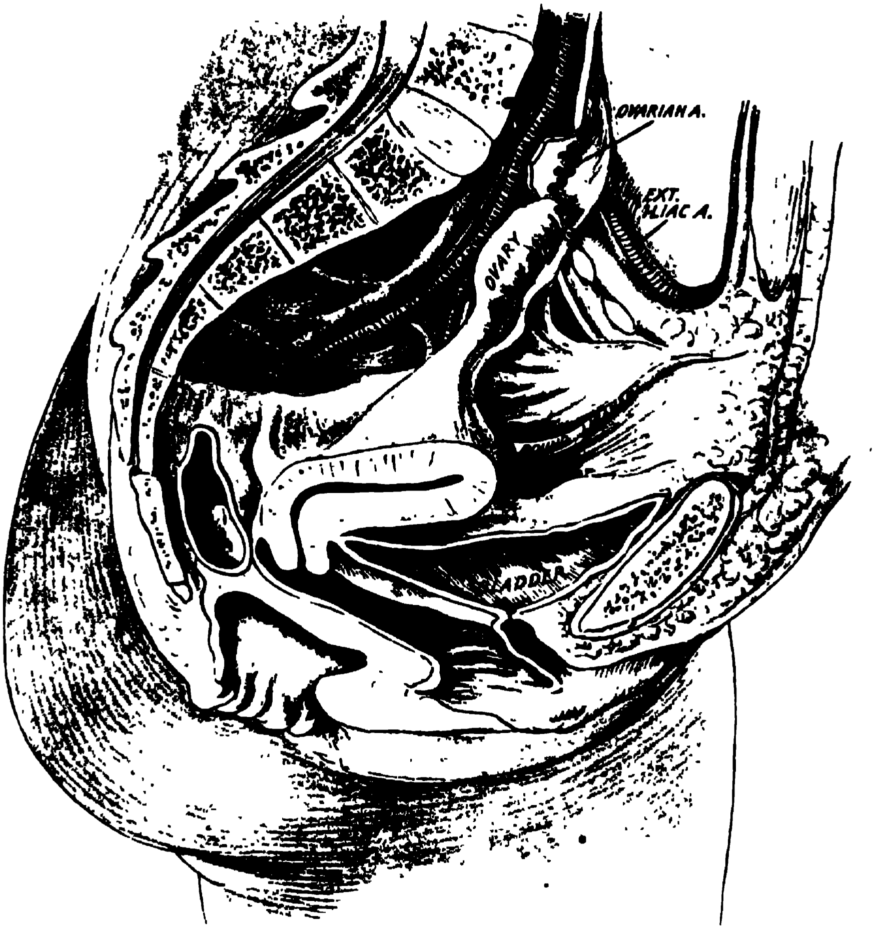

FIG. 2.—MESIAL SAGITTAL SECTION THROUGH THE PELVIS OF AN ADULT PAROUS WOMAN (Poirier). Signs of parity are seen in (*a*) the capacious vagina, (*b*) the enlarged ostium vaginae, (*c*) the laceration of the anterior part of the perineal body.

wall is firmly welded to the posterior urethral wall, making the separation of these structures difficult. Planes of cellular tissue allow of the easy separation by dissection of the structures which they unite to one another ; in positions where no cellular tissue is found, separation of the contiguous organs is more difficult and more likely to be attended by injury to the parts dealt with.

Behind the uterus lies a large peritoneal space which in fig. 1 has been cleared of its contents—omentum, small intestine, and pelvic colon. This space extends backwards to the anterior surface of the sacrum and is in relation inferiorly to the rectum. Placed between the rectum and the utero-vaginal junction in the lowest part of the floor of this space, is a deep peritoneal fossa which anatomists call the *pouch of Douglas.*

## THE PELVIC PERITONEUM AND CELLULAR TISSUE

**Peritoneum.**—In a mesial sagittal section (fig. 1) the peritoneum may be traced from the anterior abdominal wall to the spinal column. In fig. 2 the bladder is nearly empty and lies entirely below the level of the pelvic brim ; the peritoneum is accordingly seen coming first into relation with the back of the symphysis pubis, and then, rising gently, is reflected over the slightly curved fundus of the bladder to a point where the latter comes in contact with the anterior uterine wall. The peritoneum is separated from the bladder wall by a loose layer of connective tissue of considerable thickness, an arrangement which allows marked alterations to occur in the peritoneal relations of this organ when it becomes distended, and consequently rises upwards into the abdominal cavity proper. By the reflection of the peritoneum from the fundus of the bladder upon the uterus a peritoneal fossa or pouch is formed called the *utero-vesical* pouch; when the bladder is completely empty this pouch is wide but shallow ; when the bladder becomes distended the pouch is made narrow but deep.

From the floor of the utero-vesical pouch the peritoneum passes upon the anterior uterine wall, and may be traced over the top of this organ and down its posterior wall to the floor of the pouch of Douglas, which forms the lowest point in the body at which peritoneum is met with. Before reaching this level the peritoneum leaves the uterus, and comes into relation with the upper part of the posterior vaginal wall, a considerable layer of connective tissue lying between them. To the wall of the uterus the peritoneum is closely united, no cellular tissue being found between them except over a small area of the anterior wall (see p. 15). From the floor of the pouch of Douglas the peritoneum is reflected upon the rectum investing first the anterior wall only, and higher up the anterior and both lateral walls; at the level of the third sacral vertebra in the middle line it is reflected from the rectum upon the anterior surface of the sacrum, and passing upwards over the sacral promontory becomes continuous with the peritoneum covering the posterior abdominal wall. Over the whole of this area a considerable layer of cellular tissue is found beneath the peritoneum.

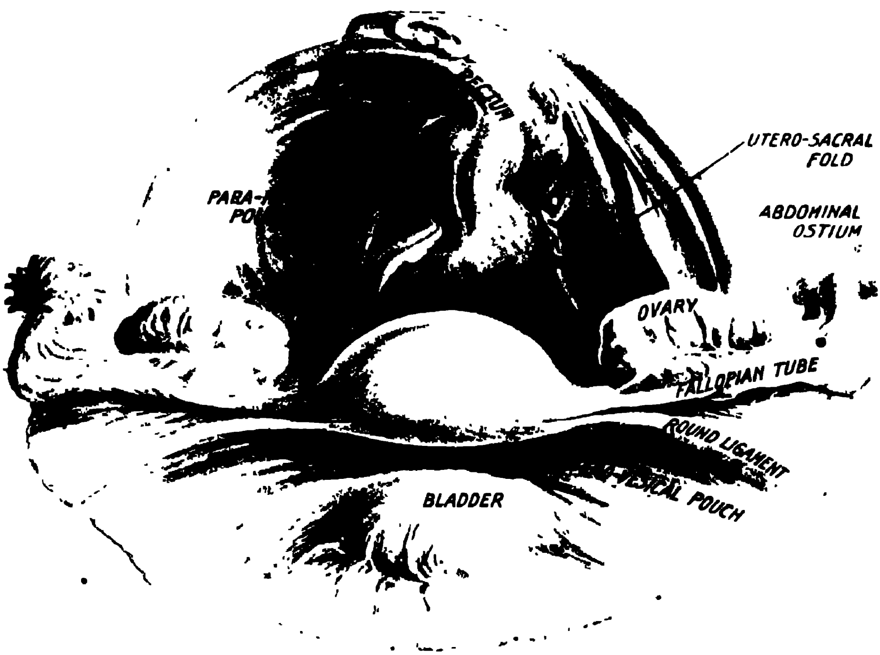

FIG. 3.—THE PELVIC ORGANS SEEN FROM ABOVE; FROM A DISSECTION (Charing Cross Hospital Museum).

Examination from above of the pelvic organs (fig. 3) shows that the pelvic cavity is roughly divided into an anterior and a posterior compartment by the uterus and certain structures directly attached to it, viz. the broad ligaments with the Fallopian tubes and ovaries, and the infundibulo-pelvic folds. These structures together form a curved transverse septum, convex in front, concave behind. The peritoneum covering the floor of the *anterior compartment* may be traced transversely from the pelvic brim over the lateral part of the pelvic wall to the side of the bladder, and over this organ to the pelvic wall and pelvic brim of the opposite side. Across the top of the bladder it forms a loose transverse fold known as the *transverse vesical fold* (fig. 3); external to the bladder the round ligament of the uterus crosses the floor of this compartment diagonally beneath the peritoneum to reach the internal abdominal ring. In the middle line the floor of this compartment corresponds with the utero-vesical pouch already mentioned. This pouch is sometimes bounded laterally by two antero-posterior peritoneal folds running from the sides of the uterus to the sides of the bladder, and called the *utero-vesical ligaments*; they are, however, feebly developed and inconstant, and can seldom if ever be recognised during operative work. The utero-vesical pouch in normal conditions is only a potential space, for uterus and bladder lie in contact with one another. When the bladder is moderately distended a pair of shallow lateral fossae may be observed, one on each side of the bladder, named the *lateral vesical pouches* or *para-vesical fossae*. They are roughly divided into anterior and posterior segments by the round ligaments of the uterus.

The *posterior compartment* is much larger and deeper than the anterior (figs. 3 and 4); in clinical usage this compartment is called the pouch of Douglas, although by the anatomist this name is reserved for the deep peritoneal fossa between the rectum and the cervico-vaginal junction. The peritoneal floor of this compartment may be traced transversely from the pelvic brim down the lateral pelvic wall to the line of origin of the pelvic diaphragm (see p. 149), and thence over the sloping pelvic diaphragm to the right utero-sacral ligament clearly discernible as a well-defined fold or ridge running backwards and outwards from the uterus to the sacrum (see figs. 3 and 4). Over this fold the peritoneum dips nearly vertically downwards to form the anatomical pouch of Douglas, ascends the opposite side to reach the left utero-sacral ligament, and so over the pelvic diaphragm to the opposite lateral pelvic wall and pelvic brim. The peritoneum which covers the anterior surface of the sacrum is reflected over the sides and anterior surface of the rectum, but does not form a complete mesentery ; at the level of the pouch of Douglas the anterior surface only of the rectum has a peritoneal covering.

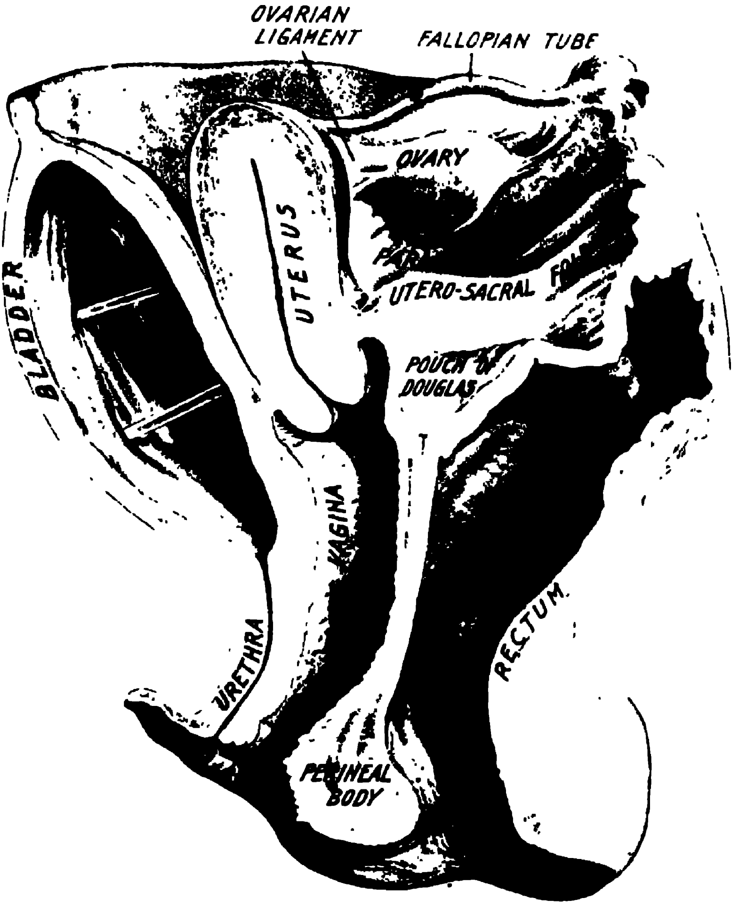

FIG. 4.—THE PELVIC ORGANS ; FROM A DISSECTION (Charing Cross Hospital Museum). The pelvic contents have been divided in mesial sagittal section.

The posterior compartment is divided by the utero-sacral folds into three fossae—the anatomical pouch of Douglas, and the right and left *para-rectal fossae* (figs. 3 and 4). The right para-rectal fossa is much more capacious than the left (fig. 3), the latter being largely filled up by the pelvic colon and the upper part of the rectum. The mesentery of the pelvic colon has an oblique attachment to the posterior wall of the left para-rectal fossa. Each para-rectal fossa is bounded in front by the posterior surface of the broad ligament, to which is attached the ovary (figs. 3 and 4). The depth of the pouch of Douglas is variable; its anterior wall usually corresponds to the upper half to three-quarters of an inch of the posterior vaginal wall, and its floor is situated about two-and-a-half inches above the anus. Its upper limits are formed by the utero-sacral ligaments, which when strongly developed slightly constrict the entrance to it. Owing to the divergent direction of these ligaments, the entrance is wider behind than in front. It is obvious that the floor of the pouch of Douglas may be reached with the finger both through the vagina and the rectum, a much larger area being accessible through the latter canal than through the former (fig. 4). Under pathological conditions the size, position, and relations of this fossa are capable of wide alterations.

## CELLULAR TISSUE

A layer of loose cellular tissue separates the pelvic peritoneum from the subjacent structures, everywhere except in relation to the body of the uterus (see p. 15). Although thus widely distributed it varies greatly in amount in different positions. Anteriorly the pelvic cellular tissue is continuous with the subperitoneal cellular tissue of the anterior abdominal wall, laterally with that of the iliac fossa; it communicates with the extra-pelvic cellular tissue through the obturator and sacro-sciatic foramina; investing the round ligament it connects, through the inguinal canal, with the subcutaneous fat of the labium majus, and through the mesentery of the pelvic colon it becomes continuous with the cellular tissue of the general abdominal cavity. It surrounds the ureters, the round ligaments of the uterus, and the visceral branches of the large vessels and nerves which supply the pelvic organs. Numerous lymphatic glands lie embedded in it, but these will be referred to more fully later on.

The general distribution and relations will be followed in fig. 5, from which it appears that the cellular tissue is located mainly in relation to the posterior pelvic compartment. Around the bladder only a thin layer is found, but at the sides of the uterus it is abundant, forming a thick lateral wedge of tissue interposed between the bladder and the sacro-sciatic notches. From this position the cellular tissue may be traced backwards to the anterior surface of the

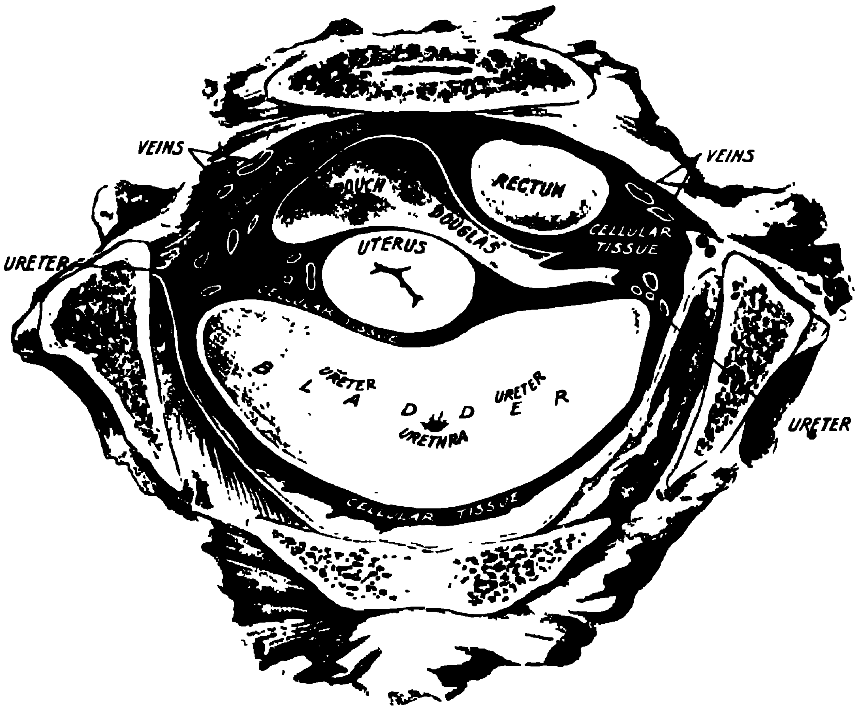

Fig. 5 — Horizontal Section through the Pelvis to show the Cellular Tissue (Martin).

sacrum, which receives a thick covering, the rectum being completely surrounded. Anteriorly the cellular tissue is most abundant between the bladder and the posterior surface of the pubes. Embedded in the lateral masses of cellular tissue lie the ureters with the uterine arteries and veins, and the large veins of the pampiniform plexus.

The pelvic course of the ureter lies entirely in the cellular tissue planes and may be traced from the sacro-iliac synchondrosis, which it reaches in company with the ovarian artery, down the lateral pelvic wall to the broad ligament; here it runs at a deep level in close relation to the posterior layer of that ligament up to the posterior vaginal wall. Thence it passes to the base of the bladder in close relation to the cervico-vaginal attachment. It is enveloped in cellular tissue throughout, and carries its own nutritive vessels. The uterine vessels cross it obliquely in passing from without inwards to reach the cervix at about the level of the internal os, the artery being placed above the ureter (see fig. 41). One or two small lymphatic glands, which may be found enlarged in operations for cancer of the cervix, are also present in the base of the broad ligament.

*Surgical Anatomy.*—The pelvic peritoneal cavity may be reached from below either through the utero-vesical pouch, or through the pouch of Douglas, by a vaginal incision. In opening the former (anterior colpotomy) the first structure to be cut is the anterior vaginal wall; then by blunt dissection through the cellular tissue lying between the bladder and the cervix, the former organ is displaced and the floor of the utero-vesical pouch may be seized with forceps and divided. It will be borne in mind that in thus displacing the base of the bladder upwards, the ureters which pierce it will also be carried to a higher level, where injury to them may be more easily avoided. In opening the pouch of Douglas (posterior colpotomy), after the vaginal wall has been divided, a layer of cellular tissue of very variable thickness is encountered, and must be separated by blunt dissection in order to reach the peritoneum. No important viscus is here endangered (fig. 5). In a multipara the peritoneum is more easily reached both in front and behind than in a nullipara, owing to the stretching which results from pregnancy and labour.

Under pathological conditions the relations of the anterior and posterior peritoneal pouches may undergo great alteration. Thus in prolapse the floor of the utero-vesical pouch may be outside the vulva (fig. 75); a tumour lying in the pouch of Douglas may depress it almost to the level of the anus, and at the same time displace the uterus forwards towards the pubes. An effusion in one of the lateral masses of cellular tissue will displace the uterus to the opposite side. Inflammation in any part of the pelvic cellular tissue may pass by direct continuity all round the pelvic cavity, and also extend to the anterior abdominal wall, to the iliac fossa, to the retroperitoneal abdominal cellular tissue, and so up to the kidney and the diaphragm; or it may pass through the sacro-sciatic foramen into the buttock, and through the obturator foramen to the front of the thigh. Collections of pus in the pelvis may also be evacuated spontaneously into any of the hollow pelvic viscera, viz. the bladder, the vagina, and the large intestine.

## THE UTERUS

When isolated from its attachments the uterus is seen to be a pyriform or pear-shaped body, the broad end being above, the narrow end below. The lower part or *cervix*, is nearly cylindrical; the upper part or *body*, being flattened antero-posteriorly, is broader from side to side than from before backwards (fig. 3). The junction of the body and cervix is indicated by a slight constriction on the external surface. The upper end of the uterine body is irregularly dome-shaped, being markedly curved from before backwards and slightly curved from side to side. This dome-shaped portion lies above the greatest transverse diameter and is called the *fundus*. The extremities of the greatest transverse diameter form the uterine *cornua*; at these points the Fallopian tubes join the uterus. In the interior of the uterus is a potential cavity lined with a mucous membrane—the *endometrium*; in health this cavity contains nothing but a very small amount of secretion produced by the mucous membrane. The uterine cavity opens below into the vagina through an aperture called the *os externum*; above, the Fallopian tubes open into it, one upon each side at the level of the greatest transverse diameter.

In a nulliparous woman the length of the whole uterus from fundus to os externum is 3 inches, while the length of the cavity is 2½ inches; in a woman who has borne several children these measurements are usually exceeded by ¼ to ½ inch. The length of the cervix is about 1 inch. The uterine wall is thickest at the fundus, and thinnest where the cervix joins the body, varying from ½ to ¾ inch. The uterus of a nullipara weighs from 1½ to 2 ozs., that of a multipara from 2 to 2½ ozs. In a nullipara the posterior surface of the uterus is flatter than the anterior; in a parous woman they are nearly alike in curvature (fig. 6).

When examined *in situ* the body of the uterus will be seen to incline slightly forwards from the cervix, so that the axis of the organ forms a curve open widely in front (fig. 2); sometimes, however, the bend is backwards instead of forwards. In the fœtus the uterine axis forms a straight line (fig. 19).

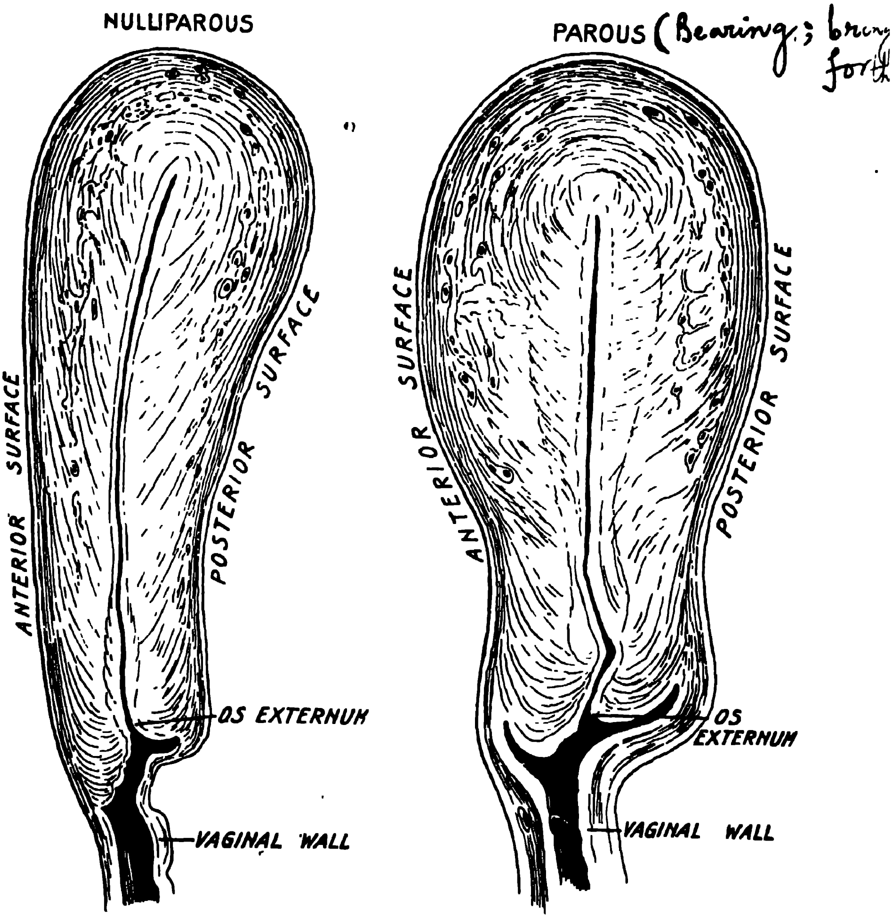

FIG. 6.—THE UTERUS IN SAGITTAL SECTION; post-mortem specimens.

The cervix is divided for descriptive purposes into a lower part which projects into the vagina and is called the *portio vaginalis*, and an upper part which lies above the cervico-vaginal attachment and is called the ***supra-vaginal*** cervix (fig. 7). In a nullipara the vaginal portion is shaped like an inverted cone, and upon the apex is the os externum, which forms a small circular or transverse aperture. After childbirth the vaginal portion is usually altered by laceration of the os and certain resultant changes in its lips; the parous os is a long, more or less patulous transverse slit. The surface of the vaginal portion is covered with a modified skin exactly similar to that covering the vaginal walls (see p. 49). The supra-vaginal cervix is cylindrical in shape; behind it is covered by the peritoneum prolonged downwards from the back of the uterus; in front it is united to the bladder by a layer of loose cellular tissue; at the sides it is in contact with the lateral masses of the pelvic cellular tissue.

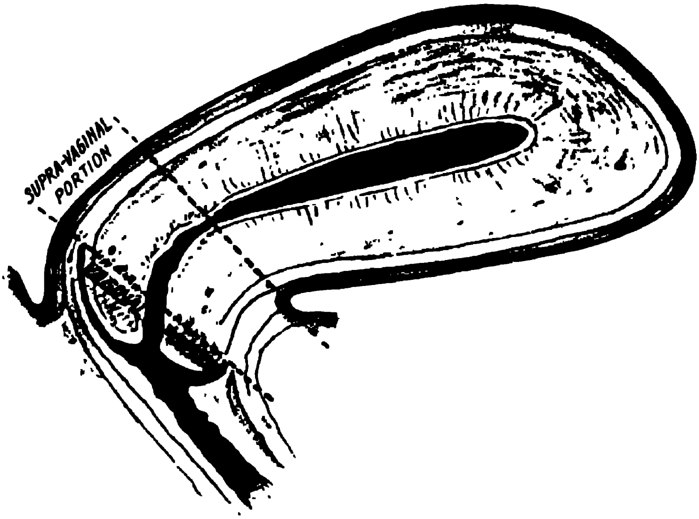

FIG. 7.—THE DIVISIONS OF THE CERVIX (diagrammatic).

When the uterus is laid open in coronal section its cavity is seen to be funnel-shaped (fig. 9). The cavity of the *body* is triangular with the apex below, the upper angles, or *cornua*, being prolonged into the Fallopian tubes, the lower into the cervical canal; the cavity of the body is somewhat larger in a parous woman than a nullipara. Where the body cavity is continued into the cervix there is a slight constriction at the *os internum*. The cavity of the *cervix* in a nullipara is spindle-shaped on coronal section, and in a parous woman it is shaped like an inverted cone from laceration of the os externum (figs. 9 and 10).

*The mucous membrane lining the cavity of the uterus* is the *endometrium.* In the body (corporeal endometrium) it is smooth and polished; with a lens the openings of glands may be seen upon it. In the cervix (cervical endometrium) it is thrown into transverse folds with intervening sulci; a raised median ridge runs along both the anterior and posterior walls, and at these ridges the transverse folds end. The whole arrangement somewhat resembles the branchings of a tree, and the name *arbor vitae* was given to it by the old anatomists. In a young nulliparous woman the endometrium of the body is about 1 mm. in thickness; in a parous woman it is very commonly twice or thrice this thickness; after the climacteric it again shrinks to about the same depth as in a nullipara.

The external surface of the uterus is invested by peritoneum which completely covers the fundus, and is reflected thence on to the round ligaments and Fallopian tubes (figs. 2 and 3). The anterior and posterior surfaces of the body are also completely covered with peritoneum, but upon the lateral aspect a considerable part has no peritoneal covering. This bare area is roughly triangular in shape, with the apex above, the base at the level of the os internum. The cervix has no peritoneal covering on the front and the sides, but the posterior surface of the supra-vaginal part is covered by the peritoneum which passes from the back of the uterus down to the floor of the pouch of Douglas. Generally speaking, the peritoneum is firmly adherent all over the uterus to

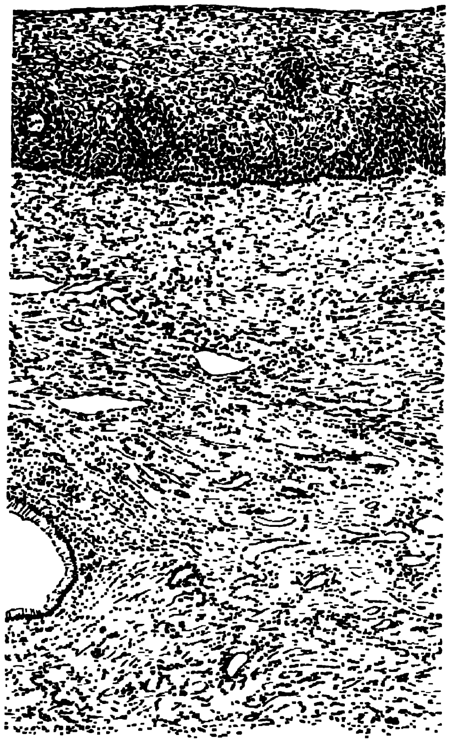
FIG. 8.—THE VAGINAL SURFACE OF THE CERVIX, showing the covering of stratified squamous epithelium, and a deep gland.

the subjacent muscle, but upon the lower part of the anterior wall, extending for about half an inch above the internal os, there is an upward extension of cellular tissue beneath the peritoneum which allows of its being stripped off the uterine wall. This area indicates the position in which

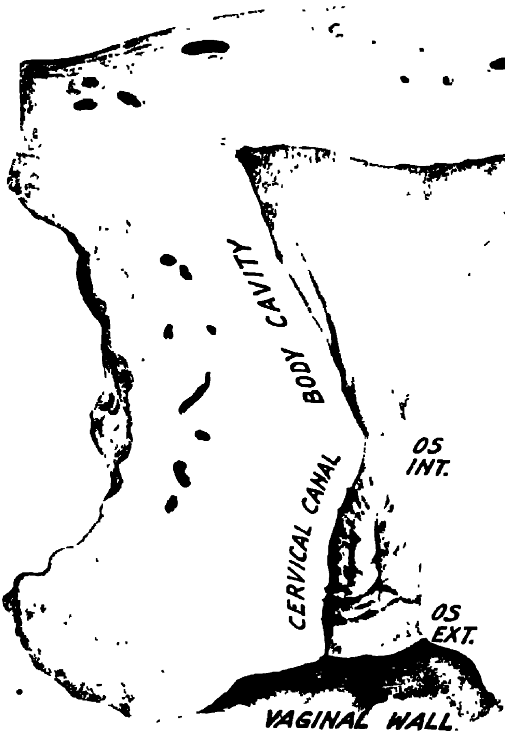

FIG. 9.—NORMAL UTERUS OF A NULLIPARA. The uterus has been bisected in coronal section, along with the surrounding cellular tissue of the broad ligaments. The cavity of the body is triangular, that of the cervix is spindle-shaped. The large vessels seen laterally are in the cellular tissue of the broad ligament.

the *lower uterine segment* is developed towards the end of pregnancy.

The uterus occupies a median position in the upper part of the pelvic cavity (fig. 1); its attachments are, for the most part, of a yielding character which allow it a wide range of normal mobility. In the erect attitude and with the bladder empty, the body of the uterus is strongly anteverted and lies nearly horizontal in the pelvis, the fundus being just below the level of the upper borders of the pubes, the os externum at the level of the ischial spines. Distension of the bladder displaces the uterus upwards and backwards, carrying it farther away from the abdominal wall. Distension of the rectum displaces the uterus upwards and forwards; variations of posture and strong muscular efforts also affect its position. In bimanual examination under anæsthesia, the uterus can be freely moved in all directions within the pelvis, or the cervix may be drawn down to the vulva with a vulsellum.

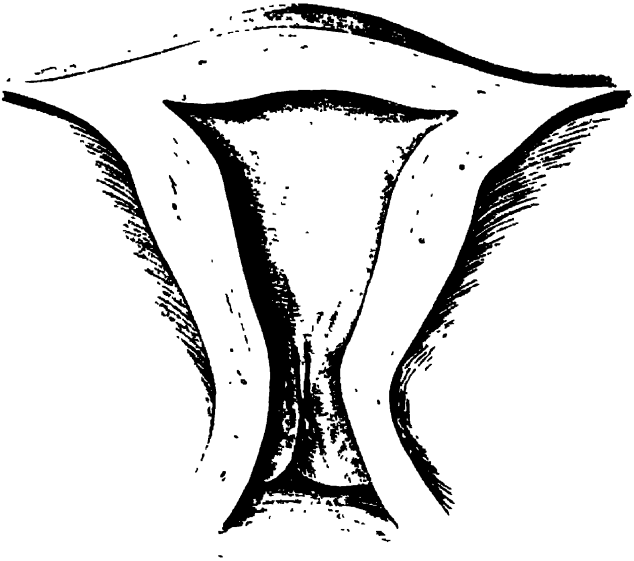

Fig. 10.—Normal Uterus of a Parous Woman. The uterus has been freed from its attachments and bisected in coronal section.

Body and cervix usually form with one another an obtuse angle equal to about 160°; but many variations occur in the adult, without any obvious departure from health. The uterine axis is usually straighter in a parous than in a nulliparous woman. Sometimes in nulliparae the angle is much more acute and may even be less than 90°.

**The Endometrium.**—The surface epithelium of the endometrium consists in all parts of a single layer of closely packed columnar, ciliated cells, resting upon a basement membrane (figs. 11 and 14); in the body the cells are of moderate height, and their nuclei are in the centre of the cells; in the cervix the cells are higher and the nuclei are in the base (fig. 14). Many mucin-containing and goblet cells are present in the cervix. The endometrium is furnished with

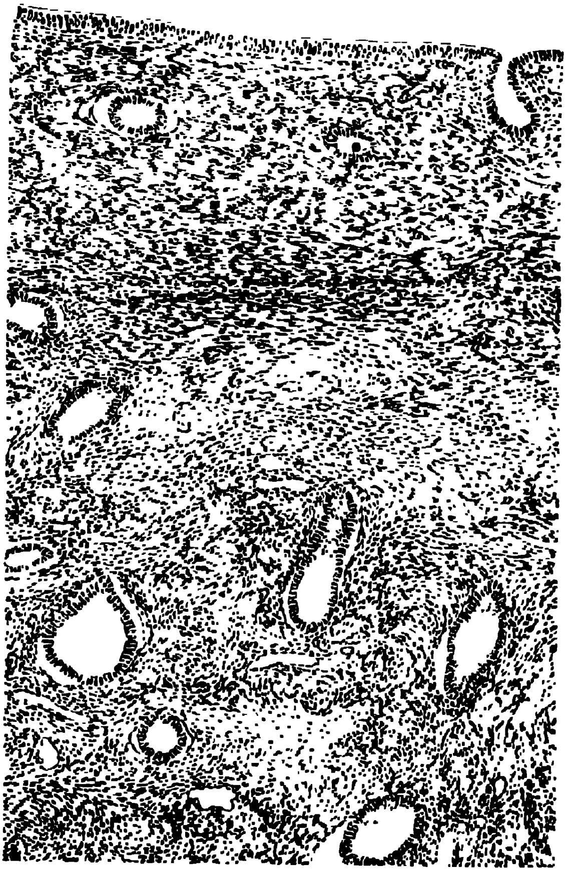

FIG. 11.—THE ENDOMETRIUM OF A NULLIPARA (high power). The glands are relatively scanty, and no branchings are seen.

glands throughout, but those of the body differ from those of the cervix.

The *corporeal glands* are simple tubular structures, running at right angles or somewhat obliquely to the surface ; many of them reach the muscular layer and some penetrate it for a short distance. The deep part of the gland is wider than its mouth and sometimes divides once, but there are no further branchings. The columnar, ciliated cells of the surface are prolonged into them, but the cilia are lost in the deeper parts. The amount of secretion produced by these glands is very small indeed

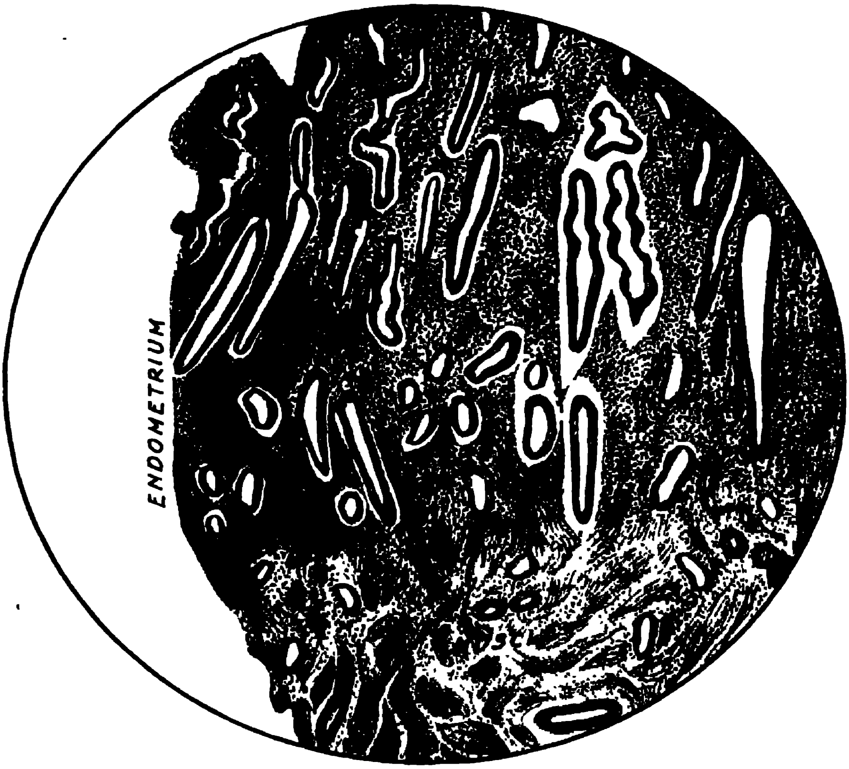

FIG. 12.—NORMAL ENDOMETRIUM OF A PAROUS WOMAN (low power). The glands are numerous, fairly regular in outline, and some are slightly dilated. The deepest parts penetrate the muscular layer of the uterine wall.

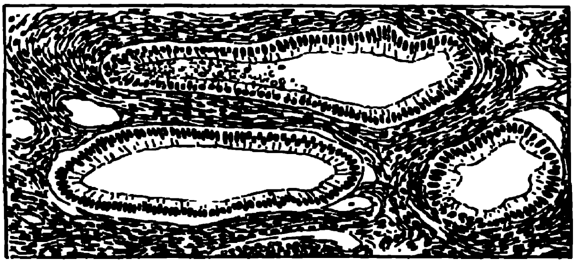

FIG. 13.—THE GLANDS OF THE CORPOREAL ENDOMETRIUM (high power).

in health, and its characters have not been closely studied.

The *cervical glands* are much more numerous than those of the body; some are simple, but most are compound racemose structures which run a spiral course, and penetrate deeply into the fibro-muscular tissue, and frequently show dilatation of the terminal portions. The dilated parts may enlarge to form small retention cysts visible and palpable upon the surface of the cervix—the so-called *ovula Nabothi*. They produce an abundant secretion which is rich in mucin, alkaline in reaction, and to the naked eye resembles white of egg, being clear, colourless and viscid or tenacious.

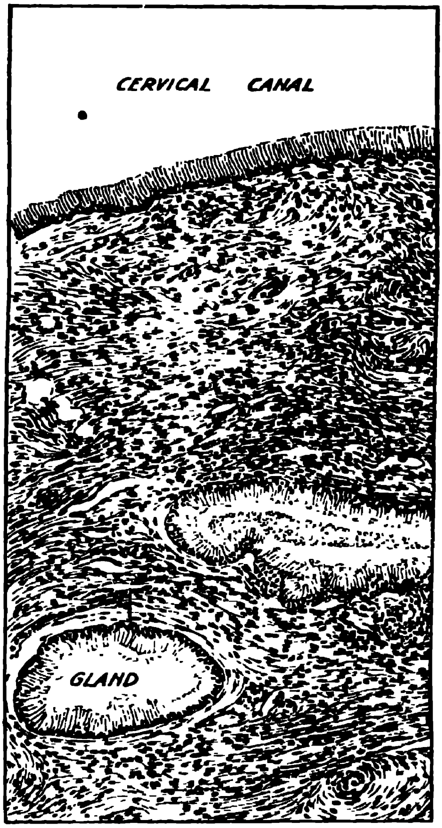

Fig. 14.—Section through the Cervical Endometrium. The surface epithelium consists of a single layer of high palisade cells, the stroma is less cellular and contains much more fibrous tissue than that of the uterine body.

The point of transition between the cylindrical epithelium of the cervical mucosa and the squamous epithelium covering the portio vaginalis is found, as a rule, at the os externum. Exceptions to the rule may occur in the fœtus, for the cylindrical epithelium may spread over the surface of the portio vaginalis (Ruge); in the adult the same variation may occur in the pathological condition called 'cervical erosion' (see p. 200); in some cases extension of the squamous epithelium into the cervical canal has also been observed in the adult.

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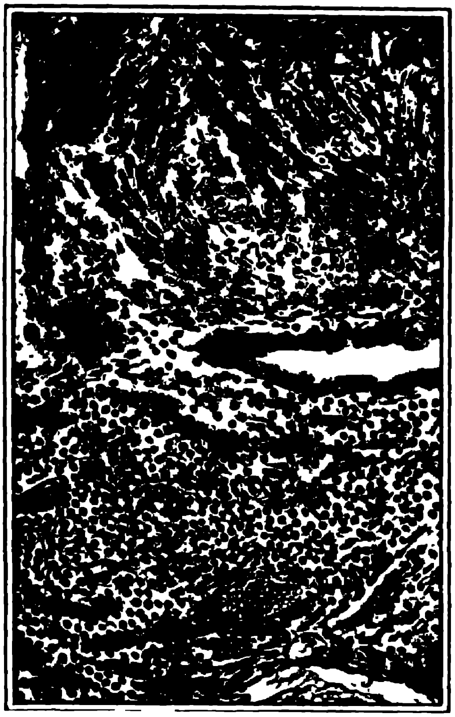

FIG. 15.—THE STROMA OF THE CORPOREAL ENDOMETRIUM. In the lower part of the figure is seen a cluster of round cells.

The recent work of Hitschmann and Adler (1907) upon the structure of the endometrium has demonstrated the remarkable fact that the uterine glands vary greatly in their character at different parts of the menstrual cycle. They appear indeed to undergo a regularly recurring series of changes, so that the appearances met with at any given part of the menstrual cycle are fairly constant, while they differ considerably from those met with at any other part. During the post-menstrual phase, lasting for a week after the menstrual period, the glands are narrow, nearly straight, and separated from one another by wide areas of stroma. During the intermediate phase, lasting for the next succeeding week, the glands are found to be wider, sinuous in outline, and placed closer together. In the pre-menstrual phase (week preceding menstruation) the glands are still wider, spiral or corkscrewed in outline, irregularly dilated in parts, presenting buds and invaginations into their lumen, and standing relatively close together; their epithelium also secretes mucus abundantly. It will be seen later, when considering the subject of endometritis, that some of these appearances have been for long regarded as pathological, whereas they now appear to represent, in reality, different phases of the normal cyclical changes which occur in women who menstruate regularly. In interpreting the appearances met with in the endometrium it is accordingly necessary to know the time which has elapsed since the last menstrual period.

The number of glands present in the endometrium appears to be very variable, not only in comparing one individual with another, but also in different parts of the same uterus. The normal limits cannot be defined with accuracy, and must in any case be widely placed.

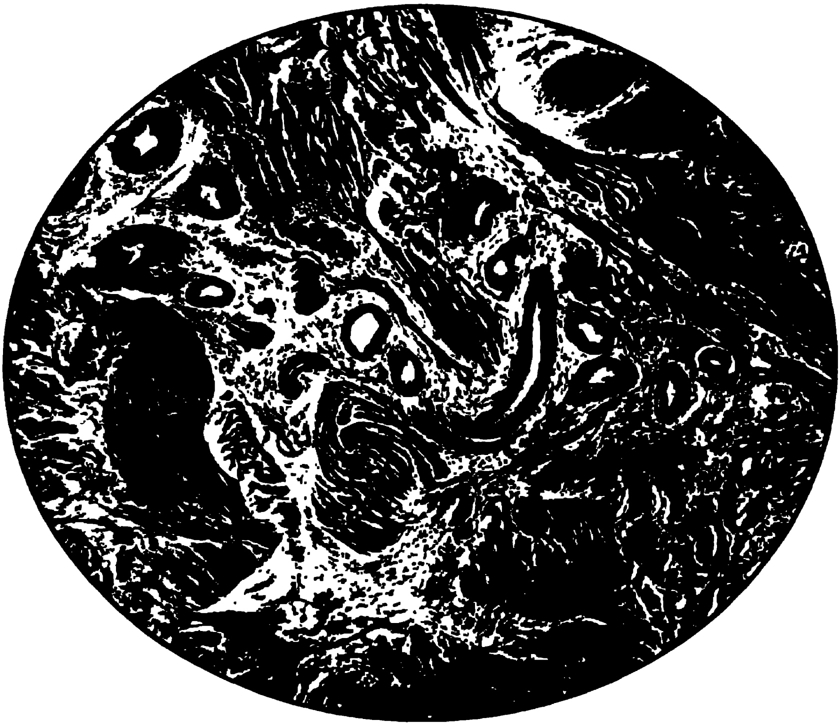

FIG. 16. –THE FIBRO-MUSCULAR LAYER OF THE UTERINE WALL FROM A MULTIPARA. The walls of the arteries are irregularly thickened; the imperfectly stained parts represent areas of degeneration in the fibrous tissue. The deeply stained parts are the bundles of interlacing muscular fibres.

The changes occurring during menstruation will be described in connection with that process (p. 73).

The *stroma* of the endometrium lies beneath the surface epithelium, and surrounds and supports the glands. In the body it is abundant, exceptionally rich in cells, and contains little fibrous tissue. The connective tissue cells are round or oval, sometimes branching cells with large nuclei; there are also numerous lymphocytes (fig. 15); the absence of connective tissue fibrils and the abundance of cells gives the stroma somewhat the general characters of lymphoid tissue. There is no submucosa, and the stroma of the endometrium rests directly upon the subjacent muscle. The relative proportions of the stroma and the glands vary at different parts of the menstrual cycle, depending mainly upon the degree of dilatation of the gland lumina. In the cervical endometrium the stroma is much less cellular, and contains a great deal of fibrous tissue (fig. 14).

**The Musculature.**—By far the greater part of the thickness of the uterine wall consists of plain muscle and connective tissue fibres. In the body the muscle fibres are arranged in well-defined bundles which, running in different directions, become crossed and interlaced with one another (fig. 16). Planes of well-developed fibrous tissue are found between these bundles, but the amount of the muscle greatly exceeds that of the fibrous tissue. No definite arrangement of the muscle fibres in layers exists in the non-gravid uterus. In the *cervix*, muscle and fibrous tissue are interwoven to form a dense fibro-muscular reticulum, in which bundles of fibres cannot be distinguished.

Through the musculature pass numerous large arterial and venous channels, surrounded by planes of fibrous tissue. The arteries run a spiral course in the uterus, and, for their size, possess very thick walls. In the uterus of a multipara vessels are frequently found showing well-marked degenerative changes (fig. 16); it is probable that such changes always form a part of the process of normal puerperal involution, and being arrested at a certain point remain permanent. There is very little elastic tissue in the uterus, but it is abundantly supplied with lymphatics and nerves.

**The Uterine Attachments.**—The attachments of the uterus may be enumerated as follows :

1. The broad ligaments.
2. The round ligaments.
3. The utero-sacral ligaments.
4. The transverse ligaments of the cervix.
5. The cervico-vaginal insertion.

*The Broad Ligaments.*—These are double folds or duplications of peritoneum, continuous with that covering the uterus, and reflected from it at its lateral borders. As seen in the living subject or in the cadaver they form loose lateral folds which run from the uterus outwards and slightly backwards, the upper border reaching the pelvic brim at a point where the ovarian vessels cross it, i.e. near the sacro-iliac joint (fig. 2). The Fallopian tube runs along the upper border between the two peritoneal layers; its outer end, the abdominal ostium, is, however, intraperitoneal, and from this point to the pelvic wall the upper border of the broad ligament is free, and is distinguished as the *infundibulo-pelvic fold* (fig. 1); the ovarian vessels run in the upper one-third of this fold.

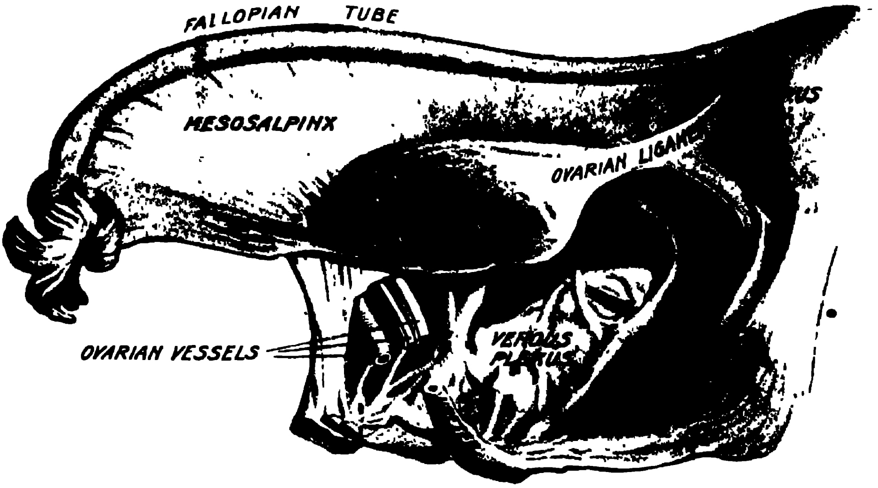

FIG. 17.—THE POSTERIOR ASPECT OF THE BROAD LIGAMENT (Charing Cross Hospital Museum).

The ovary is attached to the posterior peritoneal layer of the broad ligament (fig. 3); from the inner pole of the ovary to the cornu of the uterus runs the *ligamentum ovarii proprium,* a strong subperitoneal band of muscle and fibrous tissue (fig. 17). Beneath the anterior layer of the broad ligament is seen the round ligament running from the cornu of the uterus to the internal abdominal ring (fig. 2). The part of the broad ligament which lies between the Fallopian tube and the ovary is called the *mesosalpinx*; it is thin, translucent, contains little cellular tissue, and in it is located the parovarium (epoöphoron) with the beginning of the duct of Gartner (see p. 44).

Morphologically the broad ligaments correspond with the mesentery of the intestine, and are often spoken of as the *mesometrium*; they serve to tether the uterus, while not impeding its mobility within a certain range.

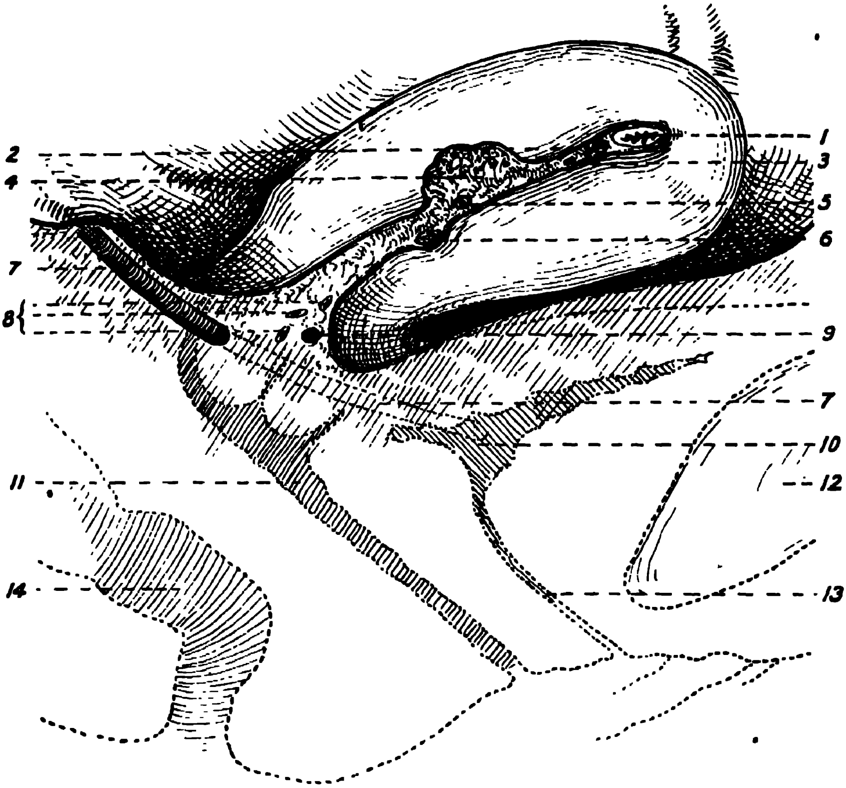

FIG. 18.—SECTION THROUGH THE BROAD LIGAMENT ABOUT ONE INCH OUTSIDE THE UTERINE BORDER (diagrammatic). 1, Fallopian tube. 2, Tubal branch of ovarian artery. 3, Parovarian tubule. 4, Ovary. 5, Ovarian artery. 6, Round ligament. 7, Ureter. 8, Uterine veins. 9, Uterine artery. 10, Bladder. 11, Vagina. 12, Symphysis pubis. 13, Urethra. 14, Rectum.

It will be seen that a number of important structures are contained between the layers of the broad ligament in addition to the cellular and muscular tissues which chiefly compose it; these structures are enumerated and their general relations diagrammatically represented in fig. 18.

*The Round Ligaments.*—These are a pair of slender cord-like structures, which arise from the anterior aspect of the uterine cornua, and pass downwards and outwards beneath the anterior peritoneal layer of the broad ligament; then curving forwards they cross to the internal abdominal ring, and passing down the inguinal canal split up and become attached to the subcutaneous tissues of the labia majora. The round ligaments are composed almost entirely of plain muscle fibres. As seen in the living subject they are lax structures of variable thickness; their course is curved and they leave the abdominal cavity at a point which may be, and often is, on a plane posterior to that of the fundus of the normally anteverted uterus. These points indicate that they play but a subsidiary part as uterine supports. In reality they are vestigial structures corresponding to the gubernaculum testis in the male.

*The Utero-sacral Ligaments.*—These structures form a pair of fibro-muscular bands, attached posteriorly to the anterior surface of the lower end of the sacrum; passing forwards within a duplication of the peritoneum they become firmly attached to the sides of the cervix a little below the level of the internal os. These ligaments form the upper borders of the lateral boundaries of the pouch of Douglas (figs. 2 and 3); in the living subject they appear to be of variable thickness, being in some cases strong and well developed, in others barely perceptible. They tether the cervix to the posterior pelvic wall, and when well developed they offer considerable resistance to excessive forward displacement of the cervix. They are, however, quite lax structures and permit a considerable range of movement.

These ligaments can usually be palpated through the rectum, and when thickened by inflammatory or other morbid processes they will be readily felt.

*The Transverse Ligaments of the Cervix* (Ligamenta transversa collis).—These structures, described by Mackenrodt, consist of bands of firm fibrous tissue, which form specialised parts of the visceral layer of the pelvic fascia; arising in the neighbourhood of the ischial spine, they pass through the pelvic cellular tissue and are attached to the sides of the cervix and vaginal vault. Unlike the other uterine ligaments, they have no special peritoneal covering. According to some anatomists they form part of the sheath of the uterine arteries, which reach the uterus at about the same level. The existence of these specialised bands of pelvic fascia has been confirmed by recent anatomical work.

*The Cervico-vaginal Insertion.*—The vaginal portion of the cervix receives an investment from the vaginal mucous membrane, the cervical and vaginal tissues being intimately united

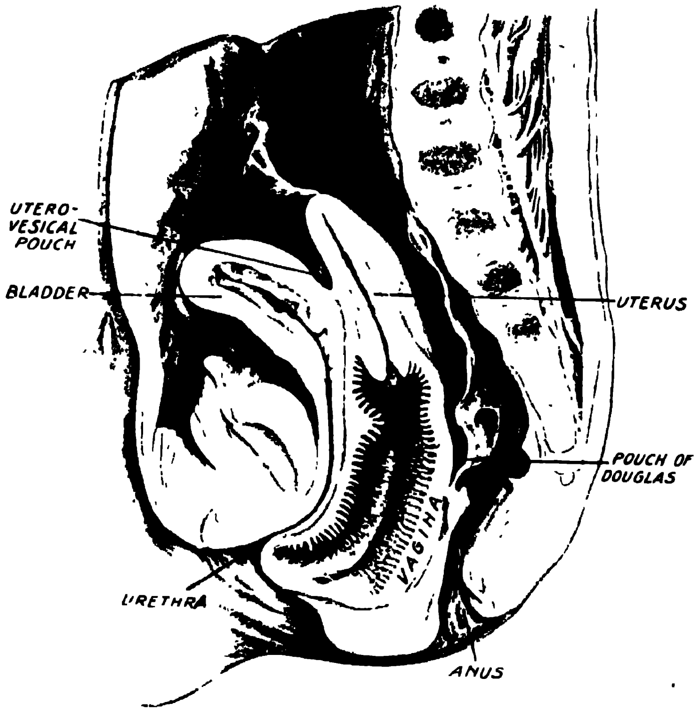

FIG. 19.—SAGITTAL SECTION OF THE FŒTAL PELVIS SEVEN TO EIGHT MONTHS' DEVELOPMENT (Charing Cross Hospital Museum). Both uterus and bladder extend above the pelvic brim; the cervix is equal in length to the body of the uterus; the vaginal rugae are very prominent.

to one another. The continuity of the genital canal is thus ensured, and the attachment serves to provide the upper end of the vagina with a *point d'appui.*

**The Uterus at Different Periods of Life.**—In the *fœtus* at about the seventh month the uterus lies above the pelvic brim (fig. 19), i.e. at a higher level than in the adult. The cervix is about equal to the body in length, and the arrangement of the cervical endometrium in the arbor vitae has already appeared. The uterine axis is straight and nearly vertical. At *puberty* the uterus begins to grow rapidly, the body more rapidly than the cervix, until the adult proportions have been reached. The angle between the body and the cervix has now appeared, the whole organ has become *anteverted, and has sunk until it lies below the level of the pelvic brim. The proportion of muscle fibres in the wall of* the uterine body increases greatly, but in the cervix this is not seen to the same extent. After *child-bearing* the uterus, as a rule, remains permanently enlarged (see p. 11); the cervix shows traces of more or less extensive parturient lacerations, and the external os is enlarged. The wall of the organ on section is seen to have increased in thickness; the endometrium may be twice or three times thicker than in a nullipara, and the musculature is also thicker. The glands of the endometrium are more numerous and larger

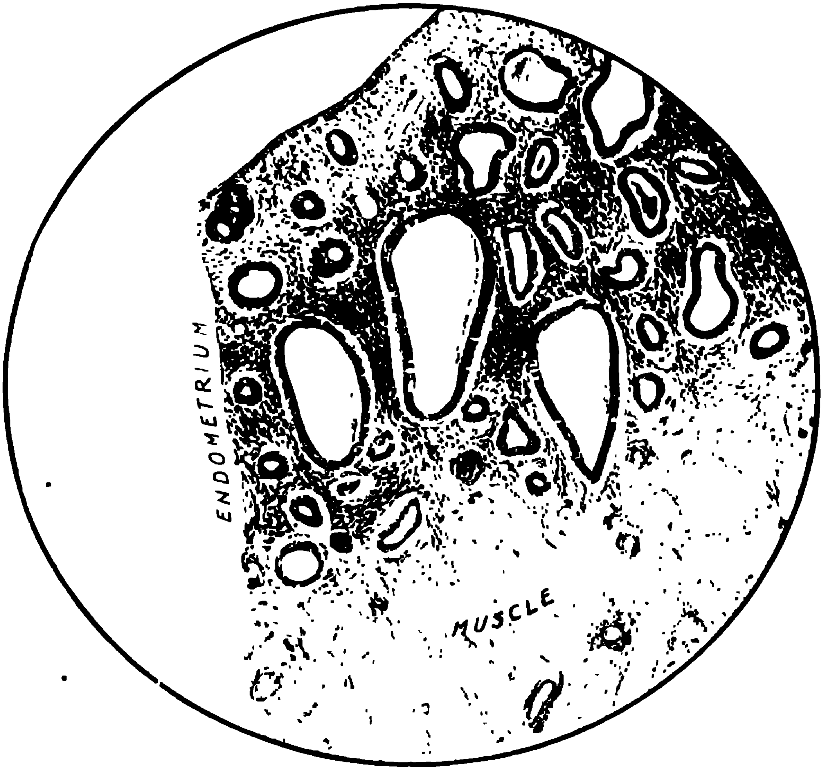

FIG. 20.—THE ENDOMETRIUM AFTER THE CLIMACTERIC. Multipara, aged 68. The mucosa is thin, and the glands are dilated, but their epithelium is well preserved.

than in the virgin (compare figs. 11 and 12). In the musculature arteries with thickened walls are usually to be found; sometimes the chief thickening is in the intima, and vessels thus affected may become obliterated; in others the media and adventitia are the seat of the thickening. Around the vessels the supporting fibrous tissue is often found to be degenerated, a zone of badly stained tissue, deficient in nuclei, being frequently seen around the cut section of the vessel.

After the *menopause* the uterus shrinks in size and in weight (see fig. 99); the shrinkage is especially evident in the cervix, for the portio vaginalis usually disappears, leaving the os externum as a small aperture, flush with the surface of the vaginal wall. The endometrium atrophies, but this process is very slow as will be seen from fig. 20, taken from the uterus of a woman sixty-eight years of age. In this section the endometrium is of about the same depth as in the virgin; the glands are numerous, but more dilated than is normal, and the surface epithelium is well preserved. Many of the arteries become obliterated and patches of calcareous degeneration may appear in their coats; much of the muscle of the uterine wall disappears, being replaced by fibrous tissue.

## THE FALLOPIAN TUBES

Representing morphologically the upper non-united portions of the Müllerian ducts, the Fallopian tubes are continuous with the uterus below, while the upper ends lie free in the pelvic cavity. Each tube is attached to the corresponding cornu of the uterus, and measures from 4 to 4½ inches in length. At first it runs horizontally outwards from the uterus, then at the junction of its inner and middle thirds it turns backwards and, describing a curve directed upwards, backwards and inwards, it surrounds the outer pole of the ovary. For descriptive purposes the tube is divided into three portions: the *interstitial* or *uterine* portion passing through the uterine wall, about a half to three-quarters of an inch in length; then the *isthmus*, a narrow cylindrical portion corresponding to the inner third (fig. 21); lastly the *ampulla*, which corresponds to the curved portion, and has the shape of a very narrow funnel gradually widening to its termination. The upper free end of the tube forms the *abdominal ostium*; around it the tube wall is divided in

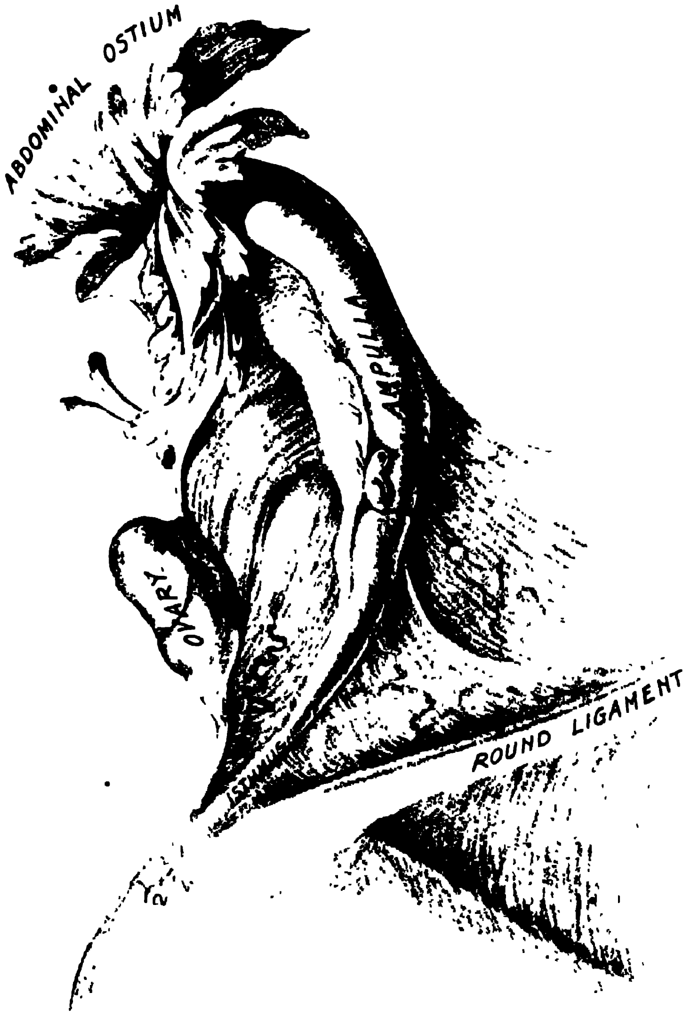

Fig. 21.—The Fallopian Tube (Richard). The figure also shows the relations of the three structures which are attached to the uterine cornu, viz. the ovarian ligament, the Fallopian tube, and the round ligament

a digitate manner into a number of *fimbriae* (fig. 21), one of which is longer than the rest, and usually reaches the ovary with its tip. The interstitial portion is very narrow, having a lumen of 1 mm. in diameter; the isthmus is somewhat wider, while the ampulla gradually enlarges to a diameter of 4–5 mm. before reaching the abdominal ostium, which opens directly into the peritoneal cavity.

Structurally the tube consists of an outer peritoneal coat, a middle muscular coat, and a lining of mucous membrane. It lies between the layers of the broad ligament, the upper border of which forms its outer coat; accordingly the floor of the tube has no peritoneal covering, but corresponds to the interval between the layers of peritoneum (fig. 18). The part uncovered by peritoneum is greater in the isthmus than in the ampulla. Beneath the peritoneum is a thin layer of highly vascular cellular tissue which is most abundant along the floor of the tube. The musculature consists of two layers of plain muscle fibres, the outer longitudinal, the inner circular.

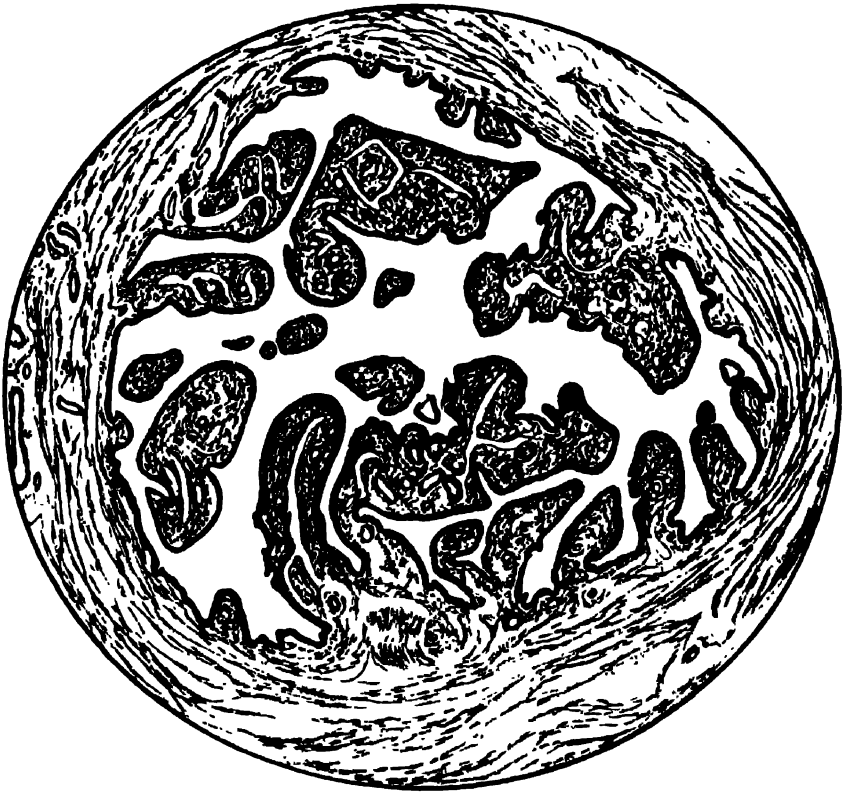

FIG. 22.—TRANSVERSE SECTION THROUGH THE ISTHMUS OF THE FALLOPIAN TUBE.

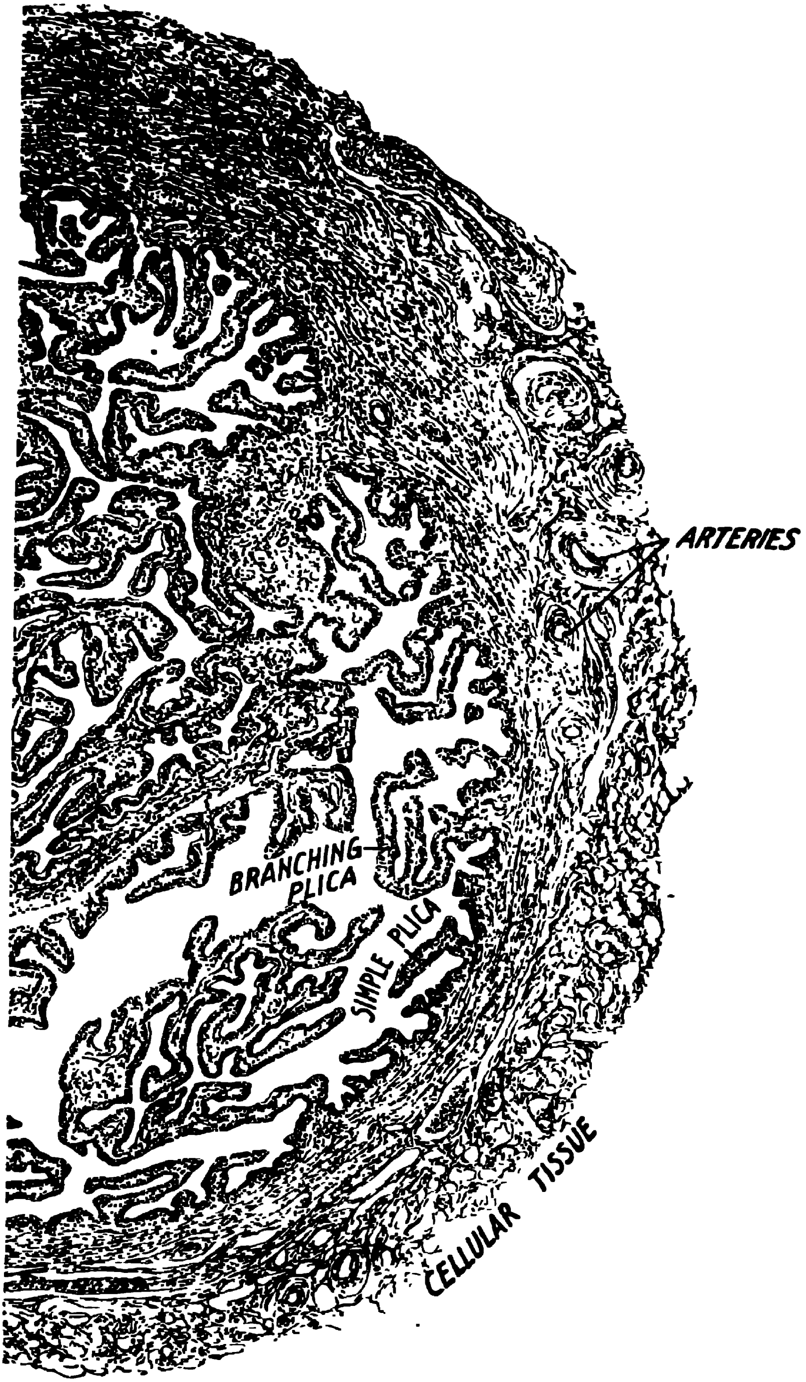

FIG. 23.—THE AMPULLA OF THE FALLOPIAN TUBE BISECTED.

The mucous membrane is continuous at one end with the endometrium, at the other with the peritoneum. It consists essentially of a single layer of columnar, ciliated epithelium, supported by a very thin layer of cellular tissue, and there is no submucous coat interposed between it and the subjacent muscle. There are no glands in the tubal mucosa. The general characters of the mucous membrane differ in different parts of the tube, but from end to end it is traversed by well-defined longitudinal folds. In the interstitial portion these folds are simple and shallow; in the isthmus they are more numerous and not simple, but divided (fig. 22); in the ampulla they form a complex arborescent mass of curling, slender processes, known as the *plicae* (fig. 23). Some of these plicae are simple, but the majority are compound, and some of the latter attain a considerable thickness; in the intervals between them the tube wall is covered with but a thin layer of mucous membrane. The lumen of this part of the tube accordingly consists of a complicated system of branching channels or interstices between the plicae, with numerous *culs-de-sac* in all parts. When the abdominal end is reached the plicae become smaller, the mucosa covering the fimbriae showing comparatively few of them.

Occasionally a second or *accessory abdominal ostium* surrounded by fimbriae may be found upon the dorsal aspect of the ampullary portion. Occasionally, also, *diverticula* may be found in the same part of the tube, forming short tributaries of the main lumen; they are lined with a plicated mucous membrane, identical with the general tubal mucosa.

The tube is supplied with blood in the greater part of its extent from the tubal branches of the ovarian artery; the innermost part of the isthmus is supplied from the anastomotic branch of the uterine artery (fig. 40). The lymphatics pass in company with those from the uterine body to the iliac glands.

The continuity of its lumen with the uterine cavity below and the peritoneal cavity above, renders the tube liable to infection from both directions. Ascending infection is seen in gonorrhœa and sepsis, the morbid process spreading by direct continuity from the endometrium (p. 402). Descending infection is seen in the case of tubercle (p. 446), and possibly of malignant disease of the ovary or some other abdominal organ (see p. 398). Further, direct infection from the bowel or the vermiform appendix may occur when the tube becomes adherent to these organs. These considerations explain the extraordinary frequency with which the tubes become the seat of inflammatory changes. The anatomical conformation of the tubal mucosa favours the retention of infective material, and the development of the inflammatory process ; and the small size of the uterine portion prevents anything like free drainage through the uterus from taking place. The numerous interstices between the tubal plicae, and the occasional occurrence of diverticula, probably explain the accidental detention of the fertilised ovum in the tube, which leads to tubal pregnancy.

## THE OVARY

The ovary is an organ which belongs to the class of ductless glands. Its normal position is in the pelvic cavity. Its general shape is oval. In an adult woman during the child-bearing period of life, it varies a good deal in size and appearance. When seen during the maturation of a Gräafian follicle it is larger and more congested than during the resting stage. The ovary is suspended from the back of the broad ligament by a linear attachment corresponding to the *hilum* of the organ (fig. 21). Here the peritoneum ceases and gives place to the proper epithelial covering of the ovary, the line of transition being often recognisable to the naked eye as the ' white line ' of the ovary. To the uterine cornu it is slung by a well-developed, somewhat flattened, band of muscle and fibrous tissue, the *ligamentum ovarii proprium* (fig. 17). This ligament receives its blood supply from the anastomotic branch of the uterine artery, which runs below it. The ovary has no peritoneal covering, and its attachments are such as to allow of a considerable range of mobility. One of the fimbriae of the abdominal ostium of the tube—the ovarian fimbria—usually touches the outer pole of the ovary, but does not afford it support. It is stated by Bland-Sutton that the ovary is sometimes furnished with a peritoneal hood, which is the homologue of the tunica vaginalis testis, but this statement lacks confirmation by other observers.

The exact position of the ovary, its inclination to the horizon, and the direction of its surfaces, though of interest to the anatomist, are questions which have no practical bearing, and therefore need not be discussed.

The average size of the ovary in the adult is about 1¾″ × 1″ × ½″, but healthy ovaries of nearly double this size are not uncommonly encountered.

The general characters of the ovary are best studied in specimens taken at some part of the child-bearing period of life (fig. 17). The outer surface is generally smooth and polished; not infrequently one or several small translucent cysts may be seen to protrude slightly from the surface; these are retention cysts formed by non-dehiscence or degeneration of Gräafian follicles. A ripe follicle may appear as a dark plum-coloured protrusion occupying a considerable area of the ovarian surface: or immediately after dehiscence it may be found collapsed, and possibly presenting a rent with slightly oozing edges. Small surface puckers or depressions represent the old cicatrices of previously ruptured follicles (fig. 17).

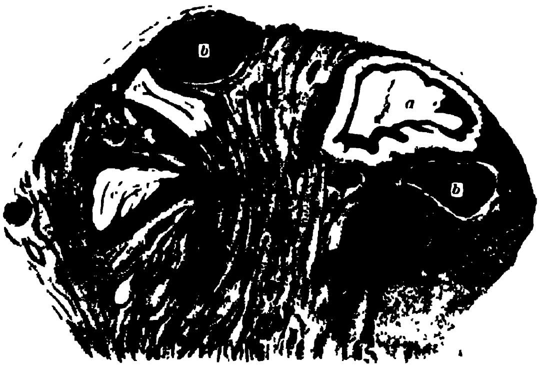

FIG. 24.—OVARY OF AN ADULT, BISECTED LONGITUDINALLY. A corpus luteum (*a*), two cystic follicles (*b*), and two corpora albicantia (*c*) are seen.

When the ovary is bisected the cut surface is roughly oval in shape, the attached border (hilum) being straight (fig. 24). The gland is usually divided for descriptive purposes into three areas—(a) *the cortex*; (b) *the medulla*; (c) *the hilum*. The *cortex* is the superficial area, crescentic in shape, forming the peripheral part of the gland. Immediately beneath the epithelial covering lies a layer of condensed fibrous tissue, often visible to the naked eye as a pale line, representing the *tunica albuginea* (fig. 24). The cortex contains the Gräafian follicles, and is, therefore, physiologically the most important part of the gland; morphologically it is distinguished as the *oöphoron* (egg-bearer). The *medulla* lies within the cortex, and is continuous with the hilum. It contains plain muscle, fibrous tissue, nerves, blood-vessels and lymphatics. The *hilum* attaches the ovary to the broad ligament. Through it pass the structures already mentioned as found in the medulla; they enter the ovary from the broad ligament. Upon the surface of the hilum is found the 'white line' of transition from peritoneum to ovarian epithelium already referred to.

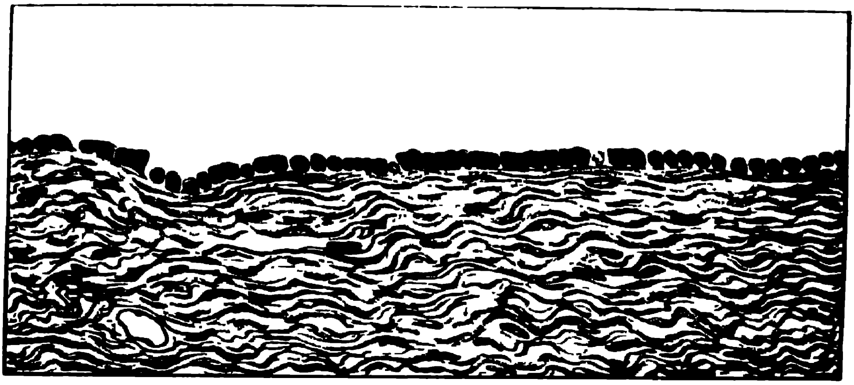

FIG. 25.—THE GERM EPITHELIUM OF THE OVARY IN THE ADULT, AND THE SUBJACENT TUNICA ALBUGINEA (high power).

The blood supply is from the ovarian artery, which runs to the ovary along the outer free edge of the broad ligament, or infundibulo-pelvic fold. The vessels all enter at the hilum. The nerves are derived from the sympathetic plexuses. The lymphatics drain into the lumbar chain of glands on the sides of the spinal column.

**Histology.**—The surface of the ovary is covered with a single layer of cubical epithelium named the *germ epithelium* (fig. 25). It is the direct representative of the embryonic hypoblast in which the ovary is developed. Careful preparation of the tissue is required to demonstrate the existence of these cells, which are very readily destroyed by handling, but traces of them can be found in almost all cases up to the age of the menopause. The epithelium rests upon a basement membrane, which in turn rests upon the tunica albuginea, which encloses and protects the body of the gland.

At times there are found in the *hilum* small imperfect tubules lined with low cubical epithelium; these are the 'cords of Kölliker,' and represent remains of the embryonic tubules which compose the Wolffian body.

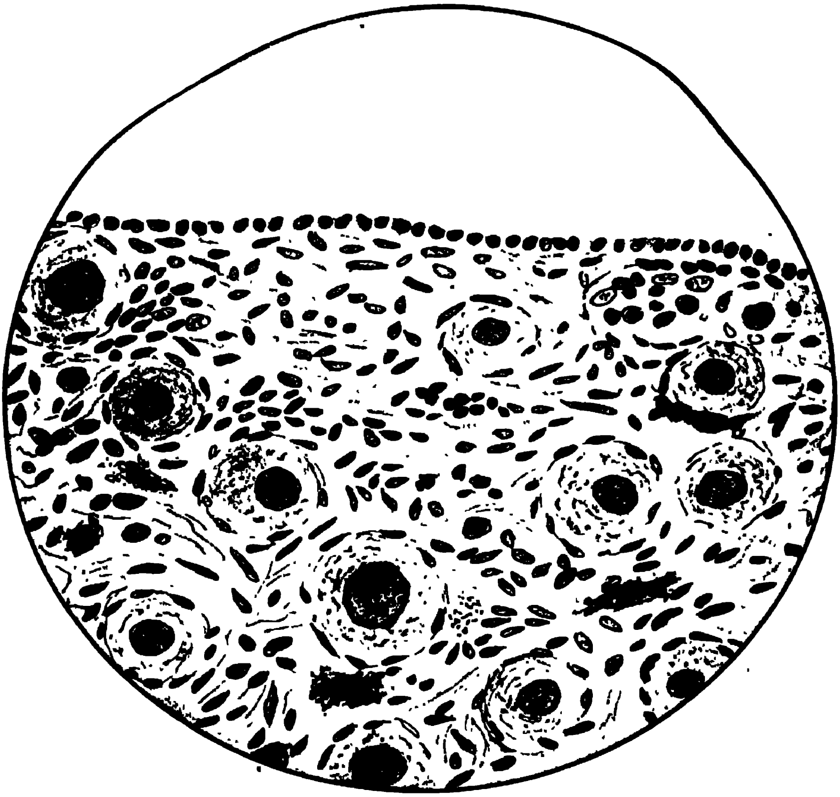

Fig. 26.—The Cortex of the Ovary of a Child (Stevens), showing the germ epithelium, and the numerous primordial follicles, containing ova.

The *cortex* contains the essential elements of the ovary (*Gräafian follicles*) embedded in a *stroma* of special characters. The stroma is highly cellular; only in two portions, viz. beneath the germ epithelium, and along the lines of the vessels, are connective tissue and elastic fibres to be found. The remainder of the cortex is non-fibrillar and consists of an aggregation of cells, some round, others fusiform, others polygonal, many of which show delicate cell processes.

They contain large round or oval nuclei (figs. 26 and 27). They are modified connective tissue cells, and their varied characters must be borne in mind in connection with the microscopic detection of certain new growths and inflammatory processes.

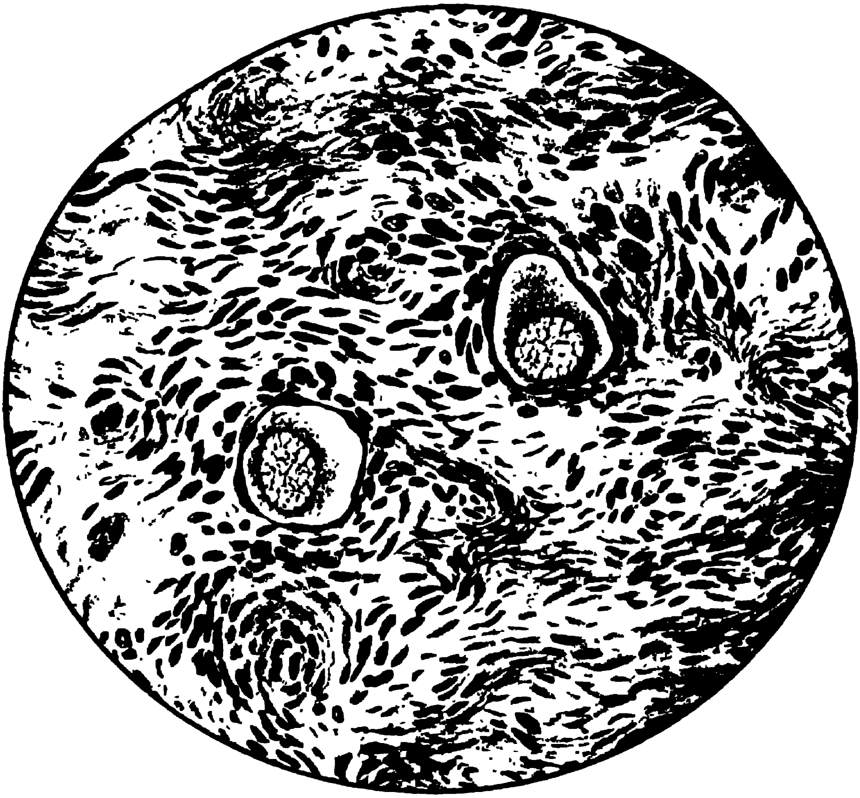

FIG. 27.—THE CORTEX OF THE OVARY OF AN ADULT, showing two primordial follicles, containing ova. The stroma is highly cellular.

The structure of a Gräafian follicle will be best understood by tracing its development. The follicles are formed at an early period of embryonic life by the downward growth, among the underlying mesoblast cells, of small processes from the germ epithelium. These processes are attacked by the mesoblast cells and cut up into small portions known as 'egg-nests.' These again in turn become further broken up, until finally a large number of structures known as the *primordial follicles* appear which consist of: (1) a large central cell, the *ovum*; (2) a single layer of flattened epithelial cells surrounding it; (3) outside this a condensed layer of mesoblast cells forming a rough capsule (figs. 26 and 27). Both (1) and (2) are produced from the included germ epithelium, i.e. they are of hypoblastic origin. Occasionally two ovum cells are found in a single follicle.

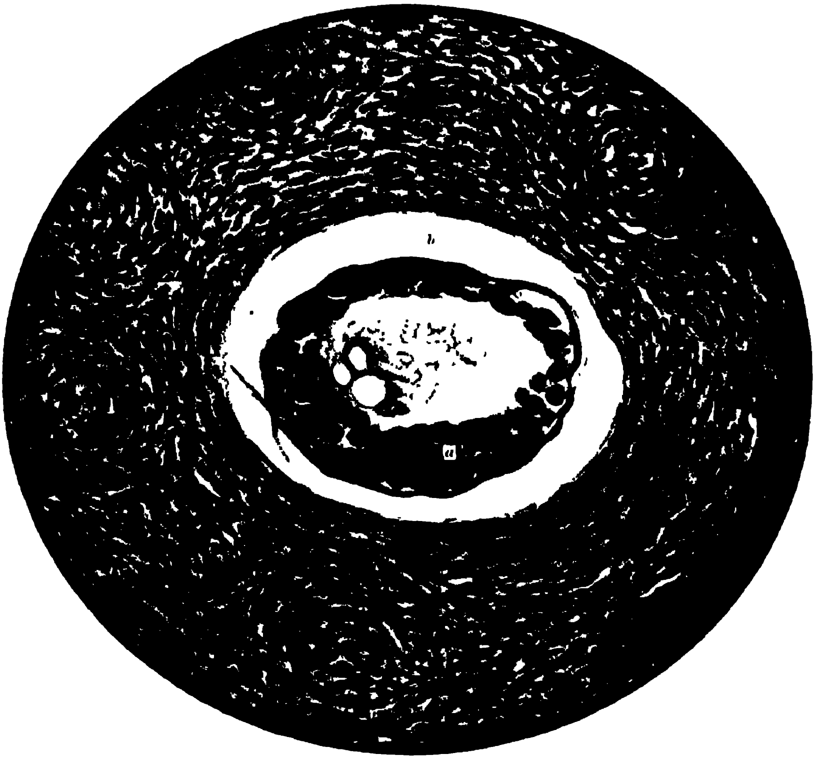

Fig. 28.—Graafian Follicle from the Ovary of an Adult. The large clear cell (*a*) is the ovum; the central space is occupied by liquor folliculi. At (*b*) is seen the double layer of cells forming the membrana granulosa. The shrinkage from the wall of the follicle is the result of hardening the tissue.

The primordial follicle is, therefore, the earliest phase; in the fœtal ovary these follicles are present in very large numbers. In childhood a further stage of development may be observed: the ovum cell enlarges but maintains its central position; the epithelial cells around it proliferate and form a double layer of cubical cells sharply differentiated from the surrounding ovarian stroma; these form the *membrana granulosa*. Follicles, such as these, are found in large numbers after puberty, and may be called *complete* follicles. The greater number remain *dormant*, but a certain number of them undergo a further process of *ripening* and *rupture* upon which depends the important function of ovulation. Ripened follicles are seldom found until after puberty ; it follows that only in the adult ovary are all three kinds of follicles to be observed.

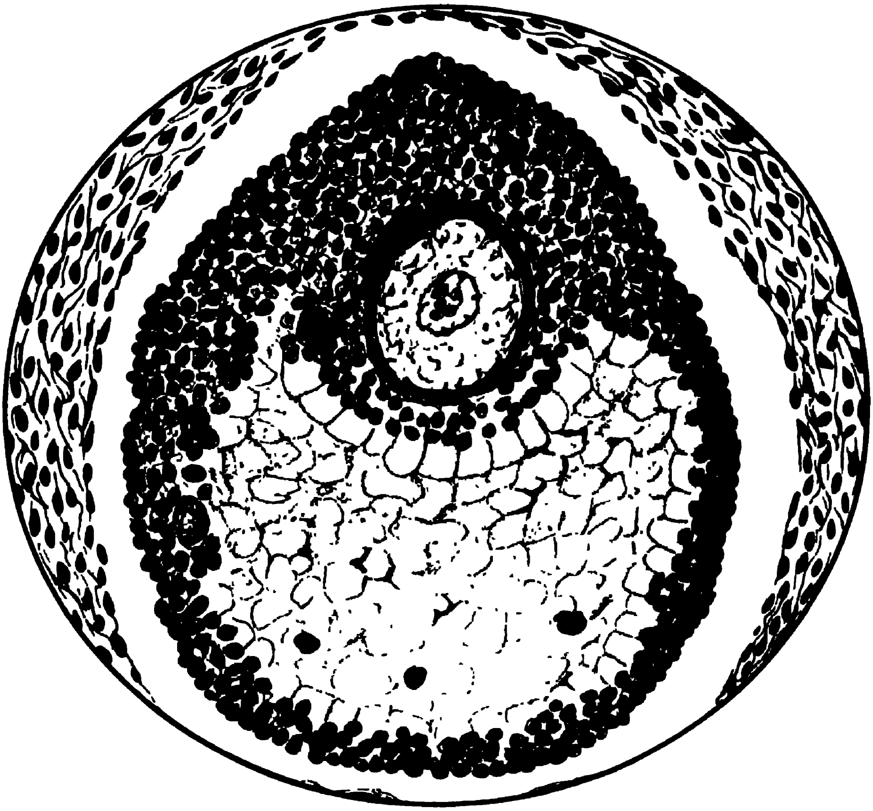

FIG. 29.—RIPENING GRÄAFIAN FOLLICLE (Stevens). An early stage showing the formation of the liquor folliculi by liquefaction of the membrana granulosa cells. The ovum has greatly increased in size, and the zona pellucida has developed around it.

As a rule a single Gräafian follicle ripens in one ovary at intervals of about four weeks ; it is at present unsettled whether the process coincides with menstruation or not, but the physiological bearings will be again referred to in connection with the theories of menstruation (p. 76).

Occasionally two follicles ripen simultaneously, either in the same, or it may be one in each ovary.

The details of the ripening process can be briefly summarised. Starting with the complete but dormant follicle (fig. 28), the following changes occur : (1) The central cell or ovum increases in size and the zona pellucida is developed around it (fig. 29). (2) The cells of the membrana granulosa proliferate freely, forming at first a wall of many cell layers, and later a solid mass of closely packed cells surrounding the ovum. (3) Liquefaction takes place among these cells and an excentric cavity filled with fluid—*liquor folliculi*—is produced (fig. 29). The effect of this change is to divide these cells into two portions, a cluster of cells immediately surrounding the ovum, distinguished as the *discus proligerus*, and a stratified layer lining the wall

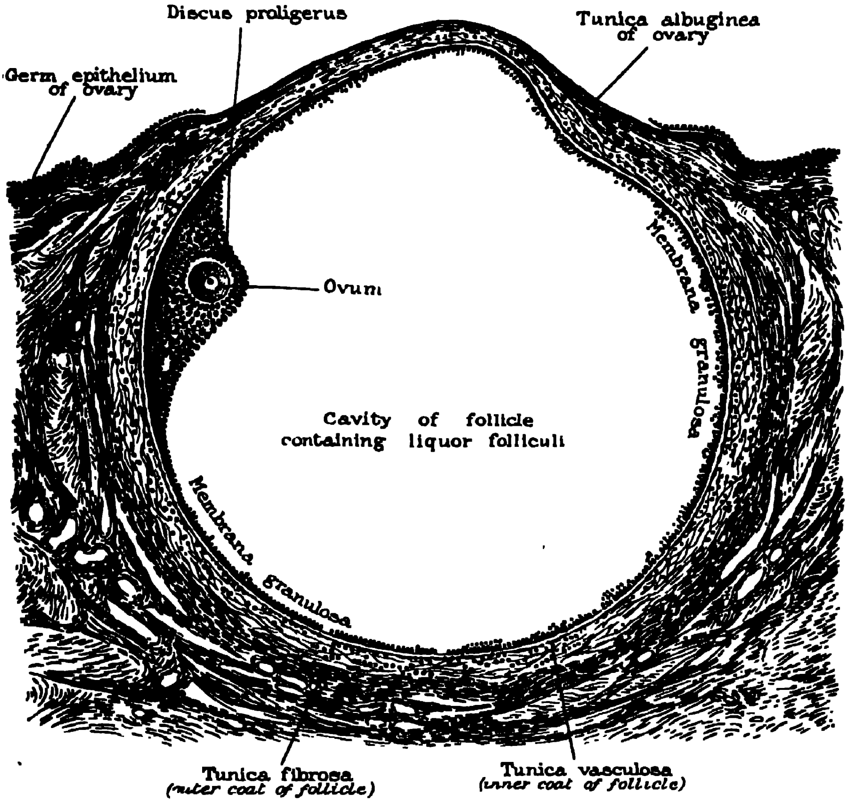
Discus proligerus
Tunica albuginea of ovary
Germ epithelium of ovary
Ovum
Membrana granulosa
Cavity of follicle containing liquor folliculi
Membrana granulosa
Tunica fibrosa (outer coat of follicle)
Tunica vasculosa (inner coat of follicle)

FIG. 30.—RIPENING GRAAFIAN FOLLICLE (LATER STAGE) PROTRUDING UPON THE SURFACE OF THE OVARY (Bumm).

of the follicle (fig. 30). (4) The follicle, which has increased greatly in size, usually sinks deeper into the ovary so as to encroach upon the medullary zone. (5) The increase in size continues, and the follicle becomes so large as to form a protuberance upon some part of the ovarian surface, usually near one of the poles of the ovary; the whole organ is now deeply congested and considerably larger than its fellow. (6) Rupture of the follicle occurs and the contents are discharged into the peritoneal cavity. Rupture is due (*a*) to increased intra-follicular tension from increase of liquor folliculi, proliferation of membrana granulosa cells, and possibly from hæmorrhage; (*b*) to degeneration of the wall of the follicle where it is exposed upon the surface. The discus proligerus is usually detached and the ovum leaves the follicle surrounded by a protective covering of several layers of cells. It may, however, be retained in the follicle, and if fertilised there *ovarian pregnancy* results.

The ripening process may be arrested before rupture occurs, giving rise to retention cysts in the ovary (p. 327). As a consequence of chronic inflammatory changes leading to thickening of the tunica albuginea, or of deposition of layers of lymph upon the surface, rupture may be prevented or delayed, and the process of ovulation thus inhibited or retarded.

*The Corpus Luteum.*—After rupture a process of repair is initiated, and in this phase the follicle is known as the *corpus luteum.* The process of repair has been closely studied and gives rise to characteristic changes, which again sometimes become the starting-point of certain pathological conditions.

The cavity of the ruptured follicle is at first filled up with blood effused from the site of rupture; the degenerated granulosa cells are mostly cast off, their place being taken by many layers of actively proliferating polygonal cells of epithelioid character, in which a yellow pigment called lutein has appeared. These cells are therefore called *lutein cells.* So well marked are their characters that their presence in a structure of indeterminate nature is sufficient to prove it to be active ovarian tissue. Their origin from the connective tissue cells of the tunica vasculosa has now been proved, although they were previously believed to arise from the membrana granulosa. Owing to the collapse of the follicle after evacuation of its contents, the wall becomes convoluted along its entire length from the formation of folds, and the lutein layer thus comes to acquire its characteristic sinuous outline (fig. 31). Subsequent changes consist in the absorption of the central blood clot, the complete occlusion of the cavity by proliferating lutein cells, and the gradual shrinkage of the entire body. It has been recently shown that masses of lutein cells can often be found scattered through the ovarian stroma, so that their function is probably not strictly limited to the repair of the ruptured Gräafian follicle. Soon the lutein cells undergo a kind of hyaline degeneration, losing their nuclei and cell outlines, and becoming transformed into structureless masses. These masses in turn are replaced by connective tissue which invades them from the surrounding ovarian stroma ; at this stage the follicle is usually called the *corpus fibrosum* or *corpus albicans*. Not infrequently the corpus albicans becomes broken up by the invading connective tissue into sections which may become widely separated from one another, and which often persist as hyaline, structureless areas for long periods (fig. 24). Finally all trace of lutein cells disappears, and only a small

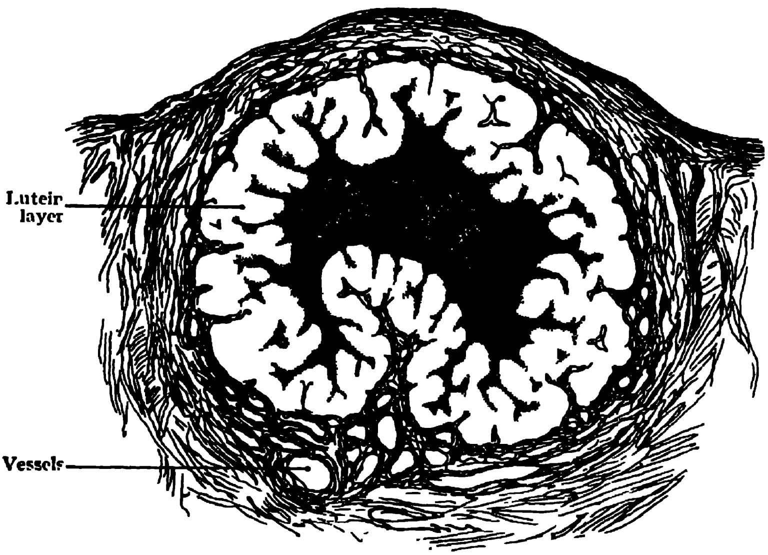

FIG. 31.—CORPUS LUTEUM THREE WEEKS AFTER MENSTRUATION, showing the central clot and the convoluted lutein layer (Bumm).

depressed cicatrix remains upon the surface of the ovary to indicate the previous site of the corpus luteum (fig. 17). The length of time occupied by these changes is variable, becoming longer as age advances ; many weeks are probably always required for their completion.

The process of repair may become arrested after the appearance of the lutein cells, and a degenerative process may set in, resulting in the conversion of the corpus luteum into a *lutein cyst* (see p. 328). Sometimes a process the reverse of this arises, and the proliferation of lutein cells assumes excessive proportions, a considerable part of the ovary being invaded by them. The significance of this abnormal activity of the lutein cells is not known.

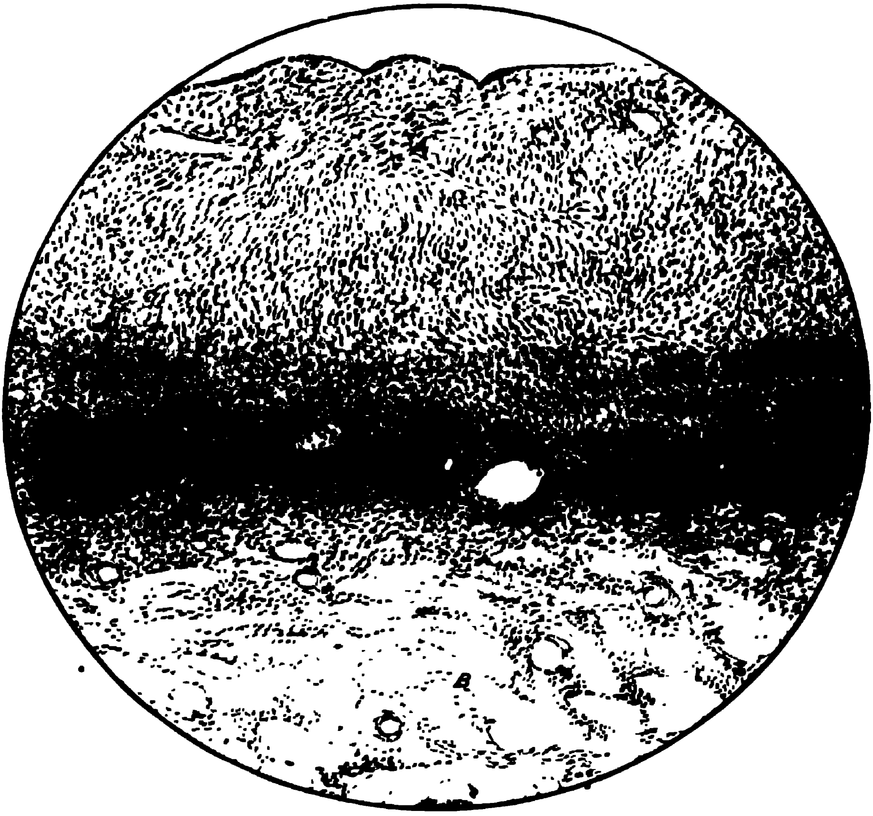

FIG. 32.—THE OVARY OF A WOMAN OF 56. *A*, Cortex; *B*, Medulla The Graafian follicles have entirely disappeared, and the cortex contains a large proportion of fibrous tissue.

**The Ovary at Different Periods of Life.**—It has already been indicated that the structure of the ovary varies at different periods of life. Thus in *childhood* the organ is smooth, solid, about the size of an unshelled almond, and on microscopic examination is seen to contain enormous numbers of primordial follicles with some complete, and a few imperfectly ripened ones; but, as Stevens has shown, rupture of these follicles does not occur. In *adult life* the ovary is larger, pinkish in colour, often contains several small cysts which bulge upon its surface, and microscopically presents large numbers of complete follicles in various stages of the ripening process, in addition to recent or old corpora lutea. The stroma is highly cellular. In *advancing age* the ovary is smaller than at any other period, hard in consistence, white and shrivelled; on microscopic examination no follicles can be found in it, but hyaline areas representing old corpora albicantia may be seen; the stroma consists largely of well-formed, wavy fibrous tissue, and the arteries show either thickening of their walls or complete obliteration from endarteritis (fig. 32). The germ epithelium can sometimes be demonstrated even in old women, but the cells are then nearly flat instead of cubical.

**The Parovarium.**—The parovarium or organ of Rosenmüller is a vestigial organ situated between the layers of the upper part of the broad ligaments, usually named the *mesosalpinx*. It corresponds to the epididymis and the vas deferens in the male, and is accordingly developed from part of the Wolffian body and the Wolffian duct. In the broad ligament of an adult woman it can readily be seen with the naked eye by separating tube and ovary from one another, and allowing a good light to pass through the translucent mesosalpinx (fig. 33). In the child it is ill-formed, but grows steadily thereafter, until in middle life it reaches its highest point of development. It consists of a varying number of vertical tubules (usually twelve) which, beginning in blind extremities near the hilum of the ovary, ascend towards the tube and then fuse with a larger horizontal tubule running at right angles to them. The outer end of the latter tubule is blind and sometimes divides into several branches which are named *Kobelt's tubes*; the inner part passing towards the uterus bends downwards, and running between the layers of the broad ligament reaches the vaginal fornices and may sometimes be traced along the anterior vaginal wall as far as the vulva. This long tube is the homologue of the vas deferens, and is named *Gartner's duct.*

The wall of the parovarian tubules consists of plain muscle, and sometimes a distinct lumen lined by columnar, ciliated epithelium persists. Cystic dilatations are not infrequently seen in the adult. The vertical and horizontal tubules of the parovarium proper can almost invariably be found; the downward prolongation forming Gartner's duct is often absent. Attached to the mesosalpinx below the abdominal ostium is usually found a small pediculated cyst the size of a pea—the *Hydatid of Morgagni* (fig. 33); it arises from the Wolffian duct and is the homologue of the structure of the same name in the testis.

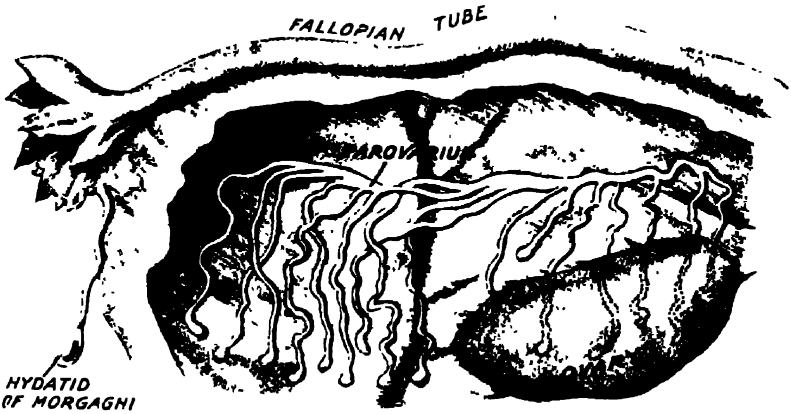

FIG. 33.—THE PAROVARIUM OR ORGAN OF ROSENMULLER EXPOSED BY DISSECTION OF THE MESOSALPINX (Follin).

**The Physiology of the Ovary.**—The outstanding function of the ovary is that of *ovulation*; this process includes the storage of ova in a condition of latency, the ripening of the protective Gräafian follicles, their rupture and the consequent discharge of the ovum into the peritoneal cavity. The histology of this process, together with the subsequent process of repair, by which the damage done to the ovary is made good, have been already briefly described. These changes are of great interest, and are without parallel in any other organ. Upon the function of ovulation depends the menstrual process, the occurrence of gestation, and the continuance of the species ; it is therefore, from the general point of view, one of the most important of all the bodily functions.

Ovulation is a periodic process, and occurs, it is believed, at approximately regular intervals of from three to four weeks. It is uncertain whether it coincides with menstruation or not, but this point will be again referred to in connection with the theories of menstruation. We cannot explain either its periodicity, or by what mechanism the process is initiated at regular intervals. Occasionally in infancy or childhood a Gräafian follicle ripens, but the regular establishment of the process commences about puberty, and ceases at the menopause. There is a certain amount of evidence that ovulation occurs alternately in each ovary, but removal of one ovary does not appreciably diminish fertility, so that alternation is probably not an essential feature of the process. As a rule only a single Gräafian follicle ripens at one time, but occasionally one in each ovary may ripen simultaneously. There is no satisfactory evidence that ovulation ceases during pregnancy or lactation, as was at one time supposed.

There is good reason to believe that, in common with other ductless glands, the ovary produces an *internal secretion* which is of great importance to the general nutrition of the body. The existence of such a secretion is probable, judging from the analogy of other ductless glands. The complete removal of both ovaries, during the years when they are active, is followed by well-marked constitutional and local changes—the *artificial menopause*, while the retention of even a small portion prevents the occurrence of these changes. To this extent the results of removal of the ovaries are analogous to those which follow removal of the thyroid gland. Further evidence has been sought by administering to women who have been deprived of their ovaries, ovarian tissue, as an extract prepared from the ovaries of sheep or lambs. The results have, however, been quite inconclusive, and here the analogy with the thyroid breaks down, for it is well established that strumipriva thyroidea can be practically prevented by the administration of small doses of the thyroid glands of animals.

The results of removal of the ovaries in rodents has been recently studied by Carmichael and Marshall. These observers found that removal of the ovaries in young animals arrested the development of the uterus and Fallopian tubes, which remained in an infantile condition, but the general nutrition and growth of the animals was unaffected. In adult animals removal of the ovaries led to fibrous degeneration, especially of the mucosa, in the uterus and tubes, the general nutrition being unimpaired. These results cannot well be explained except upon the assumption that there is an internal ovarian secretion, and they appear to indicate that in rodents this secretion serves only to promote the development of the growing uterus, and to maintain its nutrition in adult life.

The definite constitutional and local consequences of ablation of the ovaries in women, supported by these experimental observations upon animals, justify the conclusion that the ovary produces an internal secretion which possesses important physiological properties.

Many experiments have been made upon animals in *grafting* ovarian tissue taken either from the same animal (autoplastic grafting), or from another animal of the same species (heteroplastic grafting). Pieces of ovary may thus be implanted upon the peritoneum or in the subperitoneal cellular tissue, or even in some extra-abdominal region, and their nutrition and vitality maintained. Autoplastic grafts may, when examined later, show signs of continued ovulation; heteroplastic grafts usually undergo slow degenerative changes. Similar experiments have been made in a few cases on women, the ovarian tissue being implanted upon the stump of the Fallopian tube or on the pelvic peritoneum. In only a small proportion of these scanty cases in women has the opportunity of re-examining the graft after an interval been obtained, and these cases showed that the graft had undergone extensive degeneration with disappearance of the follicles. It appears, as far as our knowledge goes at present, that ovarian grafting is physiologically unavailing, since the functional activity of the graft is not maintained.

The view has been advanced that the internal secretion of the ovary is produced by the ripening Gräafian follicle, and especially by the actively proliferating lutein cells of the corpus luteum. It appears to be highly probable that this is the case, for the only active cells found in the ovary are those of the Gräafian follicles, and it is difficult to understand from what other sources the internal secretion can arise.

## THE VAGINA

The vagina forms the lowest segment of the genital canal, and extends from the vaginal portion of the cervix to the vulva. Normally, its anterior and posterior walls fall in and come in contact with one another, so that the lumen is represented by a transverse slit wider at the sides than in the middle. When distended it becomes cylindrical. The upper extremity is partly inverted by the cervix, to which it is firmly attached ; this gives rise to the characteristic dome shape of the vaginal roof. For clinical purposes this dome-shaped portion is divided into four sections surrounding the cervix, called the anterior, posterior, right, and left *vaginal fornices*. The lower extremity, in the virgin, is partly closed by the hymen ; in the parous woman the hymen has disappeared and the vagina is usually closed by apposition of the labia majora, if the perineal body is intact ; when the latter has been extensively damaged the lower end of the vagina remains open. The general direction of the vagina is from above downwards and forwards, with a slight anterior concavity. The posterior wall is accordingly rather longer than the anterior—four inches and three inches respectively.

The vagina is surrounded by a vascular connective tissue sheath which is better developed in a nulliparous than in a parous woman (figs. 1 and 2). The *anterior* wall in its upper half comes into relation with the base of the bladder, in its lower half the urethra is closely united to it. The posterior fornix forms part of the floor and anterior wall of the pouch of Douglas (fig. 4) ; below this level the posterior vaginal wall is in relation with the rectal ampulla, its lowest part being separated from the anal canal by the perineal body. Just above the level of the right and left lateral fornices the ureters run from behind forwards to reach the bladder (fig. 18).

In the nulliparous woman both anterior and posterior walls are crossed by transverse folds or rugae, which are most pronounced in the lower third of the anterior wall. After repeated child-bearing they become wholly or partly obliterated. In some cases a median ridge runs vertically along both anterior and posterior walls—the *median vaginal column*. In the fœtus these folds are more pronounced and more numerous than in the adult, and the median columns are well marked (fig. 19).

**Structure.**—The vaginal wall consists of three layers: (1) *epithelium*, (2) *sub-epithelial connective tissue*, (3) *muscle*.

The vaginal epithelium is of the stratified squamous type resembling skin, and three layers of cells can be distinguished in it (fig. 34): (*a*) a deep layer of cylindrical cells placed at right angles to the surface; (*b*) an intermediate layer of polygonal cells; (*c*) a superficial layer of flattened cells placed parallel to the surface, in which keratoid changes occur, and which are continually being separated by desquamation. There are no glands to be found as a rule in the vaginal mucous membrane, but elementary glandular structures have in a few instances been detected by different observers. These may, however, have been derivatives of the lower part of the Wolffian (Gartner's) duct. From the deep surface of the epithelium

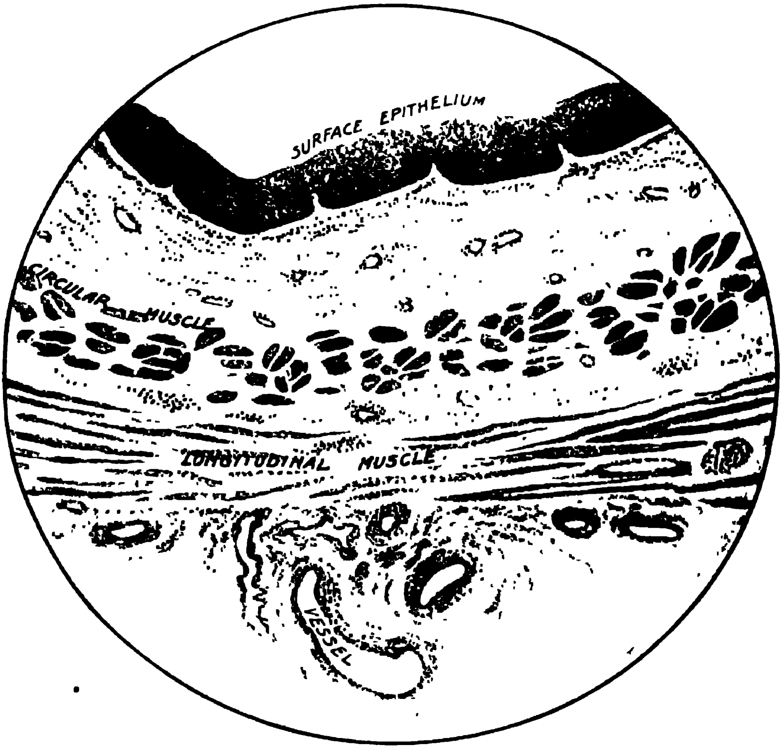

FIG. 34.—LONGITUDINAL SECTION THROUGH THE VAGINAL WALL. Taken near the upper end of the canal

*shallow finger-like processes project into the sub-epithelial* tissues; this is especially well marked on the vaginal portion of the cervix (fig. 93).

The muscular layer consists in the main of circular fibres of plain muscle; longitudinal fibres are also found outside these, but are relatively ill-developed.

Outside the vaginal walls proper is a loose sheath of vascular connective tissue in which run the large vaginal arteries and their companion veins.

The **vaginal secretion** consists mainly of a transudation through the epithelial layer from the blood-vessels; a certain amount of admixture of secretions from the uterus also takes place. Its naked-eye characters are variable. In children and in healthy nulliparous women it forms a whitish, flaky material of pultaceous consistence, which is especially abundant in the vaginal fornices, and resembles the smegma often seen beneath the folds of the clitoris. It is faintly acid in reaction. In parous women with a dilated or lacerated vaginal ostium, this kind of secretion is never seen. In the case of most parous women the secretion is thin and of creamy or watery consistence, yellowish-white colour, and neutral or alkaline reaction.

On microscopic examination the secretion is seen to contain epithelial squames, leucocytes, bacteria and débris.

The bacteriology of the vaginal secretion has been the subject of much dispute, but the following points appear to be now fairly well settled:

(*a*) In the white flaky acid secretion of children and healthy pregnant women can be found a specific bacillus, the *Scheiden Bacillus* of Döderlein; this organism grows only in acid media, and lactic acid can be found in the secretion when it is present.

(*b*) Pyogenic organisms are also sometimes found in the secretion of apparently healthy women; it is doubtful whether they are really pathogenic, they appear to exist as saprophytes and to be incapable of producing infection when inoculated in animals.

(*c*) The *Scheiden Bacillus* probably plays a protective rôle, antagonising the pyogenic cocci, and either destroying them or paralysing their activity.

(*d*) Under certain circumstances, and especially when, for any reason, the vaginal secretion becomes alkaline, saprophytic organisms present are capable of renewing their virulence and infecting the genital tract of the host. This accounts for the unusual liability to infection of the genital tract during menstruation and after child-birth.

## THE VULVA

The following parts have to be described in connection with the vulva: the mons Veneris, the labia majora, the labia minora, the clitoris with its prepuce, the vestibule with the urinary meatus, the ostium vaginae, the hymen and the perineal body.

The **labia majora** are antero-posterior folds developed by duplication of the skin at the sides of the cloaca; from the pubes they run backwards, and gradually become lost at the sides of the perineal body. They are only seen in their fully developed state in the period of life characterised by sexual activity, when they contain a large amount of subcutaneous fat. They then form thick folds, apposed to one another in the middle line, and passing anteriorly into a thickening of skin and subcutaneous fat which covers the pubes, and is known as the *mons Veneris*. The outer surfaces of the labia and the whole of the mons Veneris are covered with hair, which first appears at puberty, and after the climacteric becomes grey and scanty, and may almost entirely have disappeared as old age is reached. The usual shape of the hirsute area is triangular, the base lying about half an inch above the symphysis, the apex at the perineal body. Sometimes in brunettes the hair extends upon the anterior abdominal wall in triangular form nearly to the umbilicus, thus approximating to the male type.

In children and old women the labia majora are thin, from lack of subcutaneous fat, and the labia minora or the ostium vaginae may then be exposed. In adult women the thighs may be widely abducted without separating the labia majora from one another. The inner surfaces are covered with a thin soft skin which approximates to mucous membrane in naked-eye appearances.

In structure the labia closely resemble the general integument of the body. They are provided with large

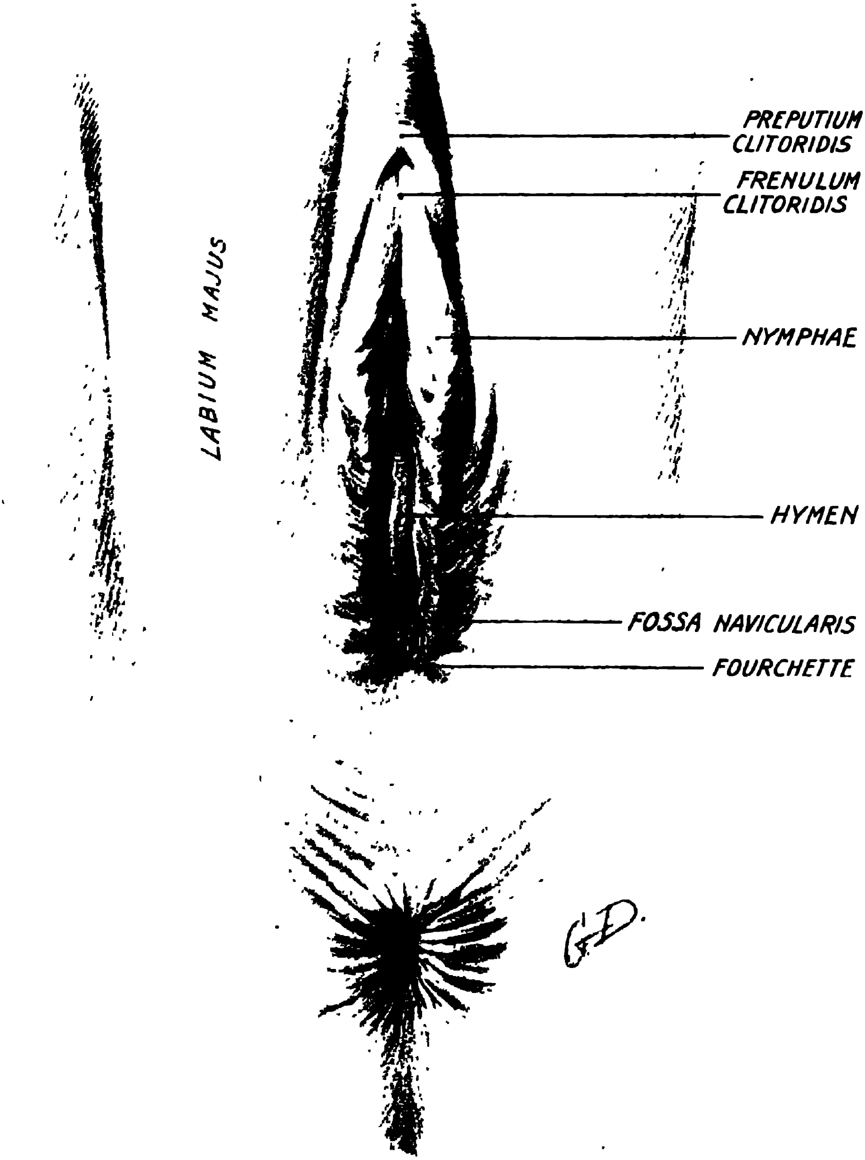

FIG. 35.—THE VIRGIN VULVA. (From a photograph.)

numbers of compound acinous sebaceous glands which are abundant even on the non-hairy parts, and are often visible there to the naked eye. There are also a few sweat glands, which, however, are poorly developed.

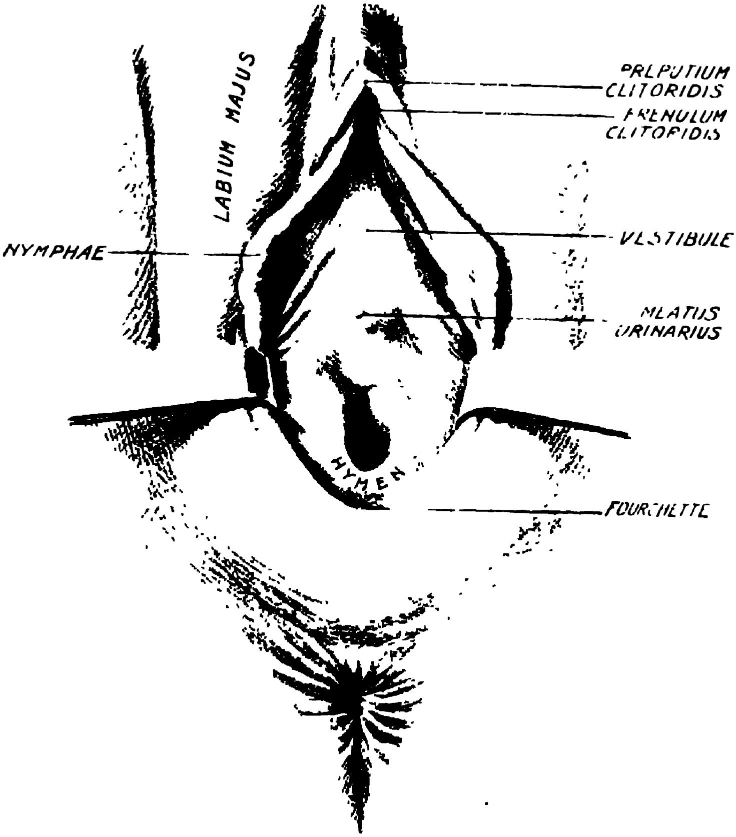

FIG. 36 — THE VIRGIN VULVA AFTER SEPARATION OF THE LABIA. (From a photograph.)

The **labia minora** or **nymphae** are a pair of thin folds of soft skin which lie within the greater labia, and form the lateral boundaries of the ostium vaginae (fig. 35). They are crescentic in outline and are united posteriorly by a transverse fold, the *fourchette*. Anteriorly each nympha splits into two folds; the anterior pair of folds fuse and pass in front of the clitoris, forming its *preputium*; the posterior pair fuse and pass behind it, forming its *frenulum*. The

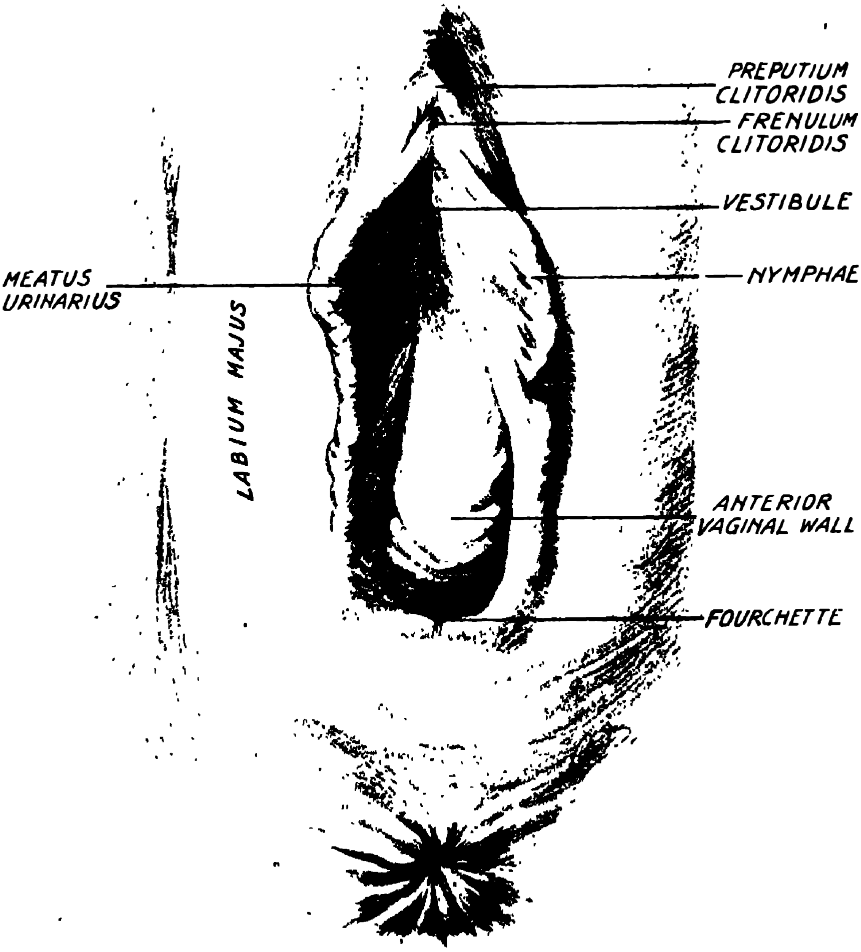

FIG. 37.—THE VULVA OF A MULTIPAROUS WOMAN. (From a photograph.) The anterior vaginal wall is prolapsed (cystocele).

nymphae are free from hair, and in brunettes they are often deeply pigmented; in children they appear relatively large and prominent owing to the undeveloped condition of the greater labia. Structurally they consist of skin richly provided with sebaceous glands; these are often visible to the naked eye in the form of pale, slightly elevated round areas.

The **vestibule** is the adult relic of the fœtal *urogenital sinus* (p. 70). It is a triangular area, the apex, directed anteriorly, being formed by the clitoris, the sides by the nymphae, and the base by the anterior border of the ostium vaginae (fig. 36). The urinary meatus lies near its base in the mesial plane. The depth of the vestibule from the surface depends upon the thickness and prominence of the labia, which always conceal it. In passing the catheter

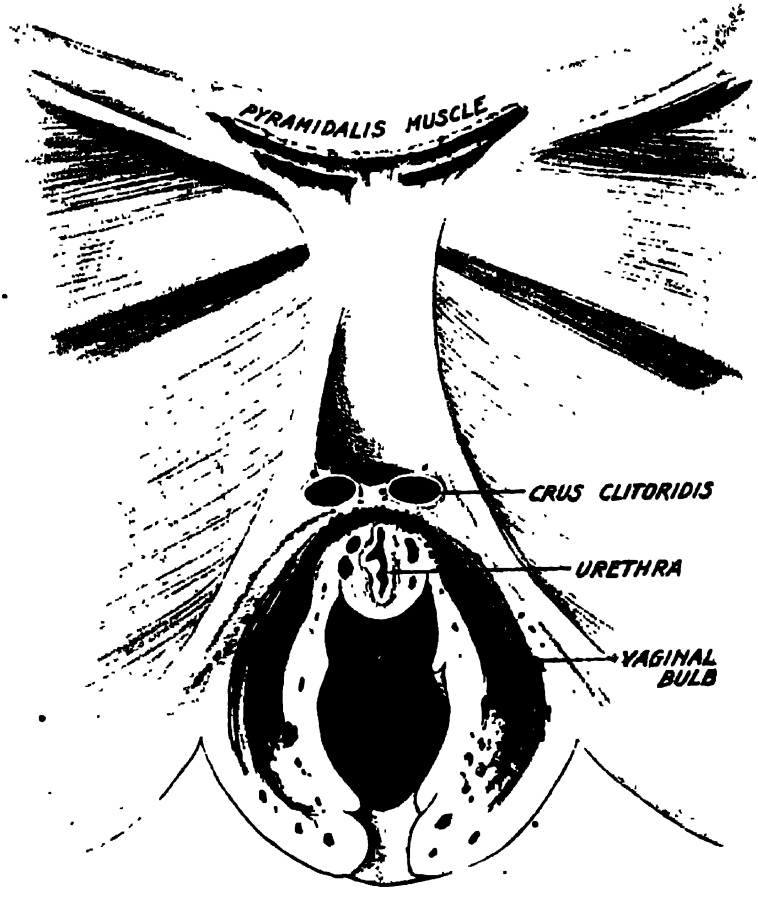

FIG. 38.—SECTION THROUGH THE EXTERNAL GENITAL ORGANS (Farabœuf). The section shows the disposition of the erectile tissue forming the crura and the bulbs.

this area must be exposed so as to be clearly seen, and to do this it is necessary to hold the anterior portions of the labia apart.

The **clitoris** is the rudimentary homologue of the male penis. It forms a small structure consisting of a *glans* about the size of a split pea, and a small *body* of variable length attached to the pubes by a pair of *crura* (fig. 38). Folds from the nymphae form a hood which covers and sometimes entirely conceals the glans—the *preputium clitoridis*. The glans is composed of erectile tissue, abundantly supplied with sensory nerves; it receives its blood supply through the artery to the clitoris, a special branch of the internal pudic. This vessel may be the source of serious hæmorrhage when lacerated. Secretion may collect beneath the preputium causing local irritation, and sometimes the margins of the folds adhere to one another so that the clitoris cannot be exposed.

The **ostium** or **introitus vaginae** is the entrance to the vaginal canal; it lies at a deep but variable level from the surface of the apposed labia. In virgins the ostium is partly closed by the hymen (fig. 36), in married women the hymen is found lacerated or stretched, and the ostium is easily dilatable; in the case of women who have sustained local injury in child-birth the ostium is enlarged and patulous (fig. 37). The *hymen* is a membrane, of average thickness of about one-eighth of an inch, attached to the posterior one-half or two-thirds of the ostium vaginae, and having usually a free, crescentic, anterior border which bisects the ostium. In front of this free border lies a space giving entrance to the vaginal canal (fig. 36). Between the posterior border of the hymen and the fourchette is a small area which, when the nymphae are separated, forms a shallow oval depression — the *fossa navicularis*. In parous women this fossa is not seen, for even slight puerperal lacerations destroy it. The shape and character of the hymen are very variable. It is sometimes attached all round the margins of the ostium vaginae; it may then have either a central aperture, or two lateral apertures separated by an antero-posterior fold of membrane, or a number of small openings irregularly distributed—*cribriform* hymen. Sometimes no aperture at all exists, so that the vagina is completely closed by it below—*imperforate* hymen. The strength and dilatability of the hymeneal membrane are variable; it may be so elastic as to stretch without lacerating during coitus; on the other hand, it may be so resistant that its removal is necessary before coitus can be completed. It follows that the presence of an entire hymen is not medico-legal evidence of virginity. In married women the hymen is, however, usually found divided by sulci into three or four portions, which have shrunk into small folds. In parous women these folds have further diminished, and appear as small sessile tubercles, four or five of which can be found around the ostium; they are called the *carunculae myrtiformes.*

Certain muscles in relation to the ostium vaginae provide for it a kind of sphincter; these are the anterior or pubic fibres of the levator ani, and the superficial perineal muscles. By voluntary action these muscles can constrict the ostium, and from reflex irritation, spasmodic contraction may occur, giving rise to the condition known clinically as *vaginismus* (see p. 496).

**Bartholin's glands** are a pair of small, glandular structures less than half an inch in diameter, lying at the sides of the lower end of the vagina beneath the superficial perineal fascia. Each has a single long duct which opens laterally at the base of the hymen, or the carunculae myrtiformes. They are the homologue of Cowper's glands in the male, and are compound tubular structures which secrete a clear translucent fluid. The ducts are very narrow, barely admitting the finest probe; they are lined, like the gland itself, with high columnar epithelium.

The **perineal body** is the mass of tissue which separates the vulva and lower part of the vagina on the one hand from the anal canal and rectum on the other, filling up the space left by the divergence of the lower ends of the alimentary and genital canals (figs. 1 and 2). It is triangular in shape, the base being formed by the cutaneous surface, the apex passing upwards to the point at which the rectal and vaginal canals come into apposition, about one inch and a half above the anus. It is composed of muscular, fibrous and fatty tissues; its base is covered with skin; its anterior wall is formed by the vagina, its posterior wall by the rectum. When intact the skin surface measures about one inch and a half from the anus to the fourchette. This structure is of considerable importance in relation to the subject of prolapse (see p. 172).

## THE URETHRA

The urethra in the female is a short canal measuring one inch and a half in length, and of somewhat spindle-shape, being slightly constricted both at the meatus and at the neck of the bladder (fig. 1). Its general direction is downwards and forwards, with a slight anterior curve. In its lower two-thirds it is closely related to the anterior vaginal wall, so that a single thick stratum of tissue separates the lumen of the urethra from that of the vagina (fig. 38); in the upper one-third a layer of loose cellular tissue intervenes, allowing the two to be separated readily from one another by blunt dissection (fig. 39). Structurally the urethra consists of muscular, submucous and mucous coats. The *muscular coat* consists of plain muscle arranged in two layers, the outer circular, the inner longitudinal; in addition, according to some anatomists, an external layer of striped muscle exists derived from the sphincter vaginae muscles, and forms a urethral sphincter. The *submucosa* consists of highly vascular connective tissue containing a large proportion of elastic fibres, and carrying the deep portions of the urethral glands. The *mucous membrane* is thrown into a number of longitudinal

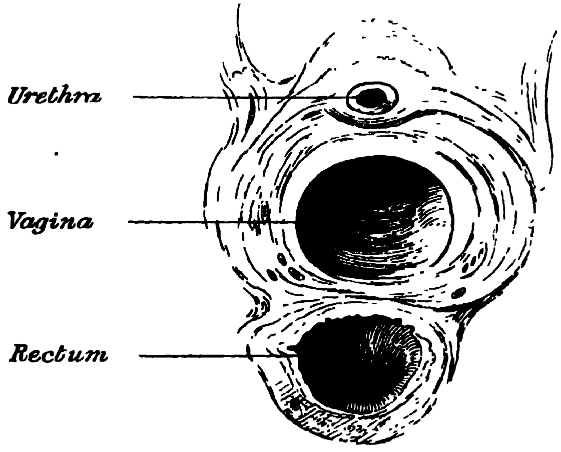

FIG. 39.—CORONAL SECTION TAKEN IMMEDIATELY BEHIND THE SYMPHYSIS SHOWING THE RELATIONS OF THE THREE CANALS.

folds and consists of stratified epithelium resting directly upon the submucosa. The superficial cells are squamous near the extremities and columnar in the middle of the canal; the deeper cells throughout are cubical and are arranged at right angles to the surface. The urethra is furnished with numerous glands which have been carefully described by Williamson and Attlee. They surround the urethra (peri-urethral), and are most numerous in the neighbourhood of the meatus. They are mostly compound racemose glands opening by a single duct upon the urethral mucosa, the deeper portions being lined by columnar epithelium. Near the meatus the ducts are often dilated, forming visible crypts. A specially developed pair of these glands, which open upon the floor of the urethra just within the meatus, are known as Skene's tubules. Morphologically the peri-urethral glands are the homologue of the prostate in the other sex.

An important characteristic of the urethra is its dilatability, which is mainly due to the large amount of elastic tissue in its walls and to the longitudinal folds of the mucosa, which become obliterated and so enlarge the superficies of the membrane during dilatation. The width to which the urethra can be dilated without laceration is variously estimated at from 13 to 30 mm. (roughly ½ to 1 inch).

## PELVIC BLOOD-VESSELS, LYMPHATICS, AND NERVES

**Blood-vessels.**—The arterial supply of the genital organs is derived from the following vessels, enumerated from above downwards:—

1. The ovarian artery from the abdominal aorta or the renal artery.
2. The uterine artery
3. The vaginal arteries (3 or 4)
4. The internal pudic artery

from the anterior division of the internal iliac.

The *ovarian* artery enters the pelvis posteriorly near the sacro-iliac joint, crossing obliquely in front of the ureter to pass into the infundibulo-pelvic fold of the broad ligament (fig. 2). Between the layers of the upper portion of the broad ligament it runs inwards to the uterine cornu, giving off many branches which supply the ovary and Fallopian tube (fig. 40). Near the uterine cornu it effects an anastomosis with the terminal branch of the uterine artery. It has two or more companion veins which freely communicate by tributaries.

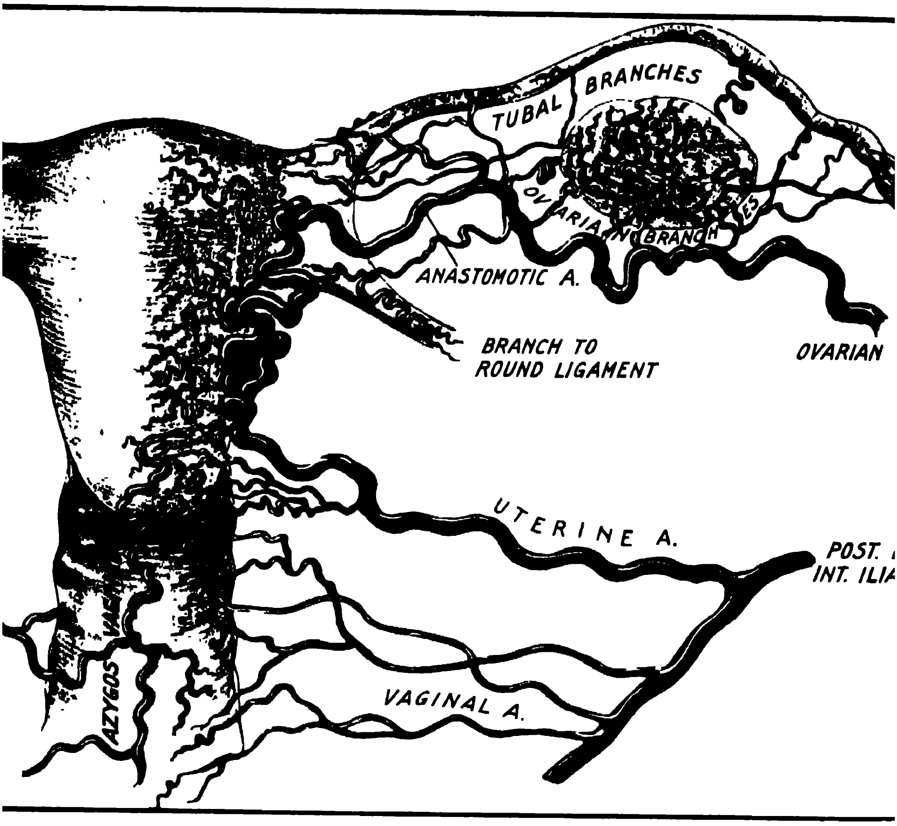

FIG. 40.—THE ARTERIAL BLOOD SUPPLY OF THE UTERUS AND VAGINA (HIS). *Note.*—The uterine and vaginal arteries usually arise from the anterior, not the posterior division of the internal iliac.

The *uterine* artery enters the base of the broad ligament near the lateral pelvic wall and runs obliquely forwards and inwards through the abundant cellular tissue to reach the side of the uterus at about the level of the internal os. It crosses obliquely above the ureter just before reaching the side of the uterus (fig. 41). The main artery now turns abruptly upwards, keeping in close contact with the uterine wall. A numerous series of branches are given off at right angles to the main trunk which pass some over the anterior, some over the posterior surface beneath the peritoneum to anastomose, in the middle line, with corresponding branches from the artery of the opposite side (fig. 40). The first of these branches to be given off is of comparatively large size, and with its fellow of the opposite side forms the *circular artery of the cervix*. Near the uterine cornu the terminal portion of the uterine artery anastomoses with the ovarian (anastomotic branch). There are numerous companion veins throughout. In the broad ligament a large venous plexus (pampiniform plexus) is formed which is

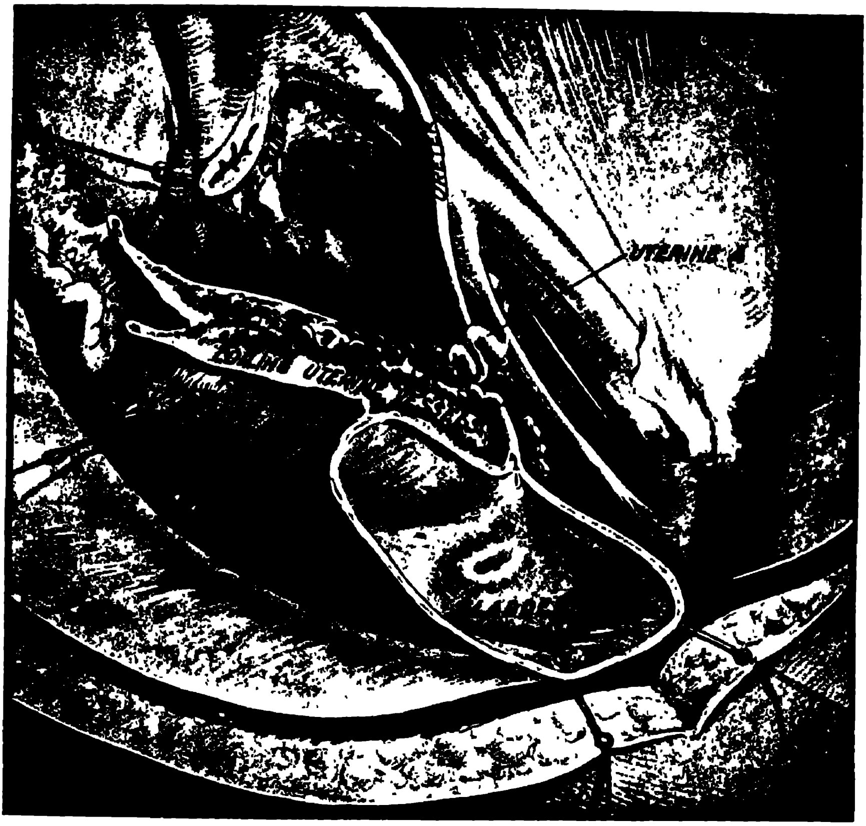

FIG. 41.—DISSECTION OF THE LEFT BROAD LIGAMENT, showing the relation of the uterine artery to the ureter (Kelly).

drained by the ovarian veins, and communicates below with the vesical and hæmorrhoidal venous plexuses.

Both the ovarian and uterine arteries and their branches run a spiral or tortuous course which forms a strongly marked characteristic of these vessels (figs. 2 and 40). This peculiarity allows of the rapid elongation of these vessels which is required to meet the physiological enlargement of the uterus in pregnancy, and also permits of their return to the normal condition of tortuosity after the still more rapid shrinkage which succeeds delivery.

The *vaginal* arteries arise from the anterior division of the internal iliac below the uterine artery ; sometimes one of them arises directly from the uterine, or from the middle hæmorrhoidal artery. They reach the sides of the vagina near its upper end, and branch irregularly, their general course being across the vaginal canal. Another artery is sometimes present, the *azygos vaginae,* which is derived partly from the circular artery of the cervix, and partly from the upper branches of the vaginal artery ; it runs along the middle line anteriorly and posteriorly. In addition to this anastomosis, numerous direct communications are formed with the branches of the uterine arteries in the region of the vaginal fornices. The vaginal veins communicate freely with the hæmorrhoidal and vesical plexuses.

The internal *pudic arteries* supply the parts composing the vulva and the perineal body ; the trunk vessel lies deeply beneath the edge of the pubic arch, and sends off numerous branches. Two of these are of some importance : (1) a large branch which reaches the posterior part of the vulva and supplies the Bartholinian gland ; it corresponds to the *artery to the bulb* in the male ; (2) an anterior terminal branch which supplies the clitoris and vestibule—*artery to the clitoris.* The companion veins are numerous and pass, some into the inferior hæmorrhoidal, some into the inferior vesical plexus. The superficial labial branches frequently form varicosities of large size in pregnancy. The vulva is almost completely encircled by highly vascular erectile tissue, arranged in two crescentic lateral masses—the *vaginal bulbs* (fig. 38). The deep transverse perineal artery and the artery to the clitoris supply them with blood. Deep laceration of the vulva may give rise to serious hæmorrhage, owing to the great vascularity of these parts.

**Lymphatics.**—The lymphatics of the genital tract pass for the most part into certain deeply placed chains of glands. These are, firstly, the *internal iliac* or *hypogastric*

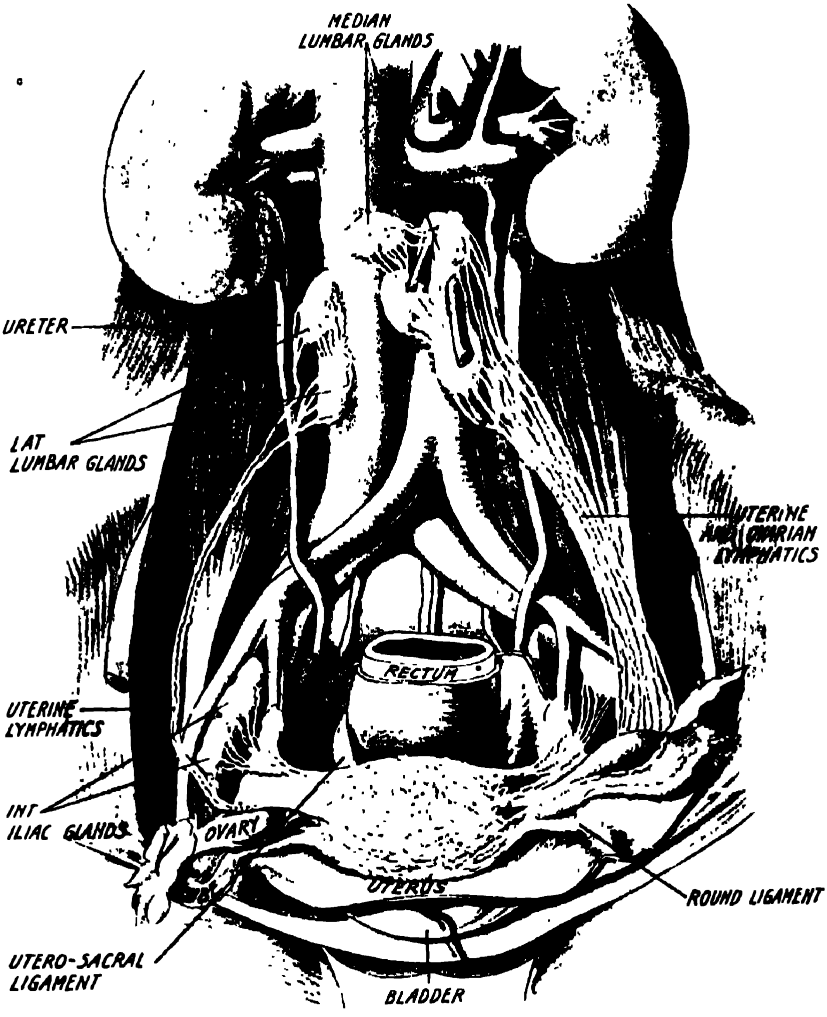

FIG. 42.—GENERAL VIEW OF THE LYMPHATICS OF THE FEMALE INTERNAL SEXUAL ORGANS (Poirier).

chain consisting of two groups—the *superior*, placed upon the lateral pelvic wall in the angle formed by the bifurcation of the internal iliac artery, and the *inferior*, lying at a lower level in relation to the uterine artery (fig. 42); secondly, the *lumbar* chain of glands placed upon the lower part of the abdominal aorta and inferior vena cava, and consisting of a *median* and two *lateral* groups (see fig. 42). Other deeply placed

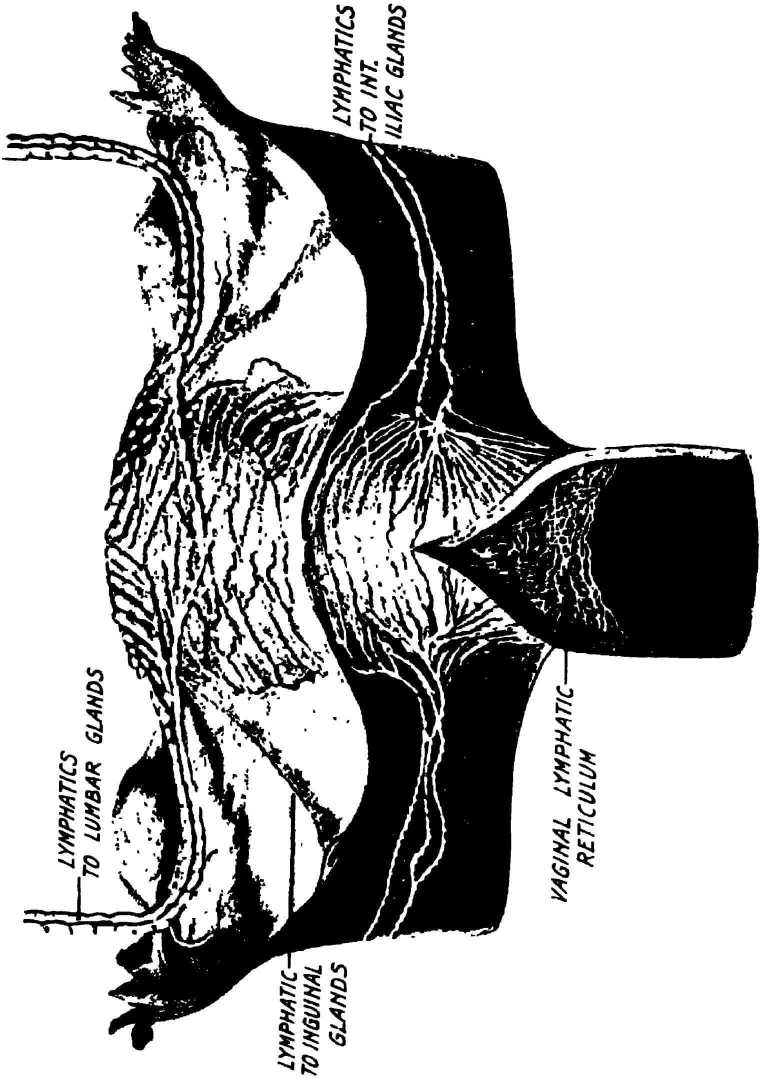
LYMPHATICS TO INT. ILIAC GLANDS
LYMPHATICS TO LUMBAR GLANDS
LYMPHATIC TO INGUINAL GLANDS
VAGINAL LYMPHATIC RETICULUM

Fig. 43.—The Uterine Lymphatics (Poirier).

glands which receive genital lymphatics are the *sacral* group, and one or two isolated glands lying between the rectum and the vagina. The only external glands which receive lymphatics from the pelvic organs are the *superior group* of the *superficial inguinal glands* placed in the groin.

Accordingly, enlargements of lymphatic glands from disease cannot be recognised by clinical examination except in the case of certain areas of the genital tract.

From the *ovary* and *Fallopian tube* the lymphatics are

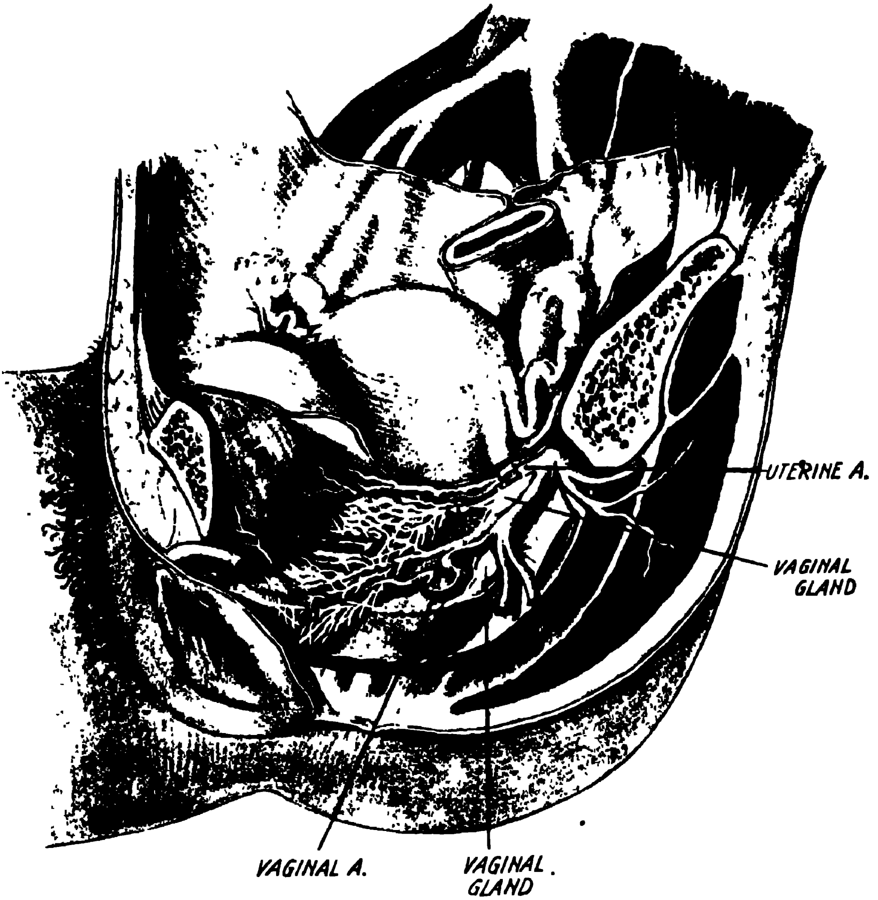

Fig. 44.—The Vaginal Lymphatics and the Glands to which they pass (Poirier).

collected into several trunk vessels which accompany the ovarian artery and veins and leave the broad ligament along with them (fig. 42). Thence they pass upwards over the pelvic brim in front of the ureter and finally join the lateral groups of the lumbar glands, those on the left lying upon the aorta, those on the right side upon the inferior vena cava.

From the *uterus* the course of the lymphatic trunks is not so simple. Those of the fundus and other parts of the uterine body anastomose to form two or three large trunk vessels which pass outwards below the ovary, and run in company with the ovarian lymphatics of the same side to the same group of lumbar glands (fig. 43). From the fundus another small trunk passes forwards along the round ligament, leaves the abdominal cavity through the internal inguinal ring, and finally joins the superior group of the superficial inguinal glands. The lymphatics of the cervix are collected into three or four large trunks which pass outwards in the lower part of the broad ligament, and join the superior group of the internal iliac chain of glands (fig. 43). Before reaching this group a small gland is often found lying in the base of the broad ligament at the level of the cervico-vaginal insertion. A small lymphatic vessel is usually found in the utero-sacral ligament which joins the *sacral glands.* Free anastomoses exist between the lymphatics of the uterus, ovary and tube, and also with those coming from neighbouring pelvic organs.

The *vaginal* lymphatics are described by Poirier as consisting of three groups. Of the *superior* group, some join those of the cervix and pass into the superior group of the internal iliac glands; the rest pass directly to the inferior group of glands of the same chain. The *median* vaginal lymphatics also pass into the inferior group of the internal iliac glands, but one or two small trunks make their way into two glands lying upon each side of the rectum, and which are in communication with the superior hæmorrhoidal glands (fig. 44). The *inferior* vaginal lymphatics, draining the parts down to the level of the hymen, according to Poirier, also pass into the inferior group of the internal iliac chain.

The *vulval* lymphatics, including those from the hymen, all pass into the superior group of the superficial inguinal chain. Free anastomoses exist between the lymphatics of one side and those of the other, so that both chains of glands may become infected from a unilateral or a median vulval lesion.

**Nerves.**—The internal genital organs are freely supplied with sensory nerves from the pelvic sympathetic plexuses; these plexuses are connected with the eleventh and twelfth dorsal nerves, and with all the lumbar and sacral nerves. From this it follows that reflex pain arising from morbid conditions of these organs may have a very wide cutaneous distribution. The external organs are supplied by the pudic nerve (sacral plexus), the inferior pudendal nerve from the small sciatic, and the ilio-inguinal nerve from the upper part of the lumbar plexus.

The motor nerves to the levator ani and superficial perineal muscles are derived from the pudic nerve and the sacral and coccygeal plexuses.

## DEVELOPMENT OF THE FEMALE GENITAL ORGANS

It is necessary that a brief outline of development should be considered in order that certain errors of development which are of clinical importance may be understood.

The *ovary* is developed in connection with the Wolffian body (mesonephros). The cælomic epithelium (hypoblast) which covers this body becomes thickened upon its mesial aspect forming the *genital gland*, a structure which at first is common to both sexes, but later becomes differentiated into ovary or testis. In true hermaphroditism (see p. 530) a single gland combining the essential elements of both (ovo-testis) may be found. When this differentiation has taken place the genital gland becomes separated from the rest of the Wolffian body. From the surface epithelium of the genital gland (*germ epithelium* of Waldeyer), solid strands of epithelial cells grow downwards into the mesenchyme, the cells of which also proliferate, and thus is produced an intergrowth of the epithelial and connective tissues which lays the foundation of the ovary. At an early stage of development (fourth month) a cortical and a medullary zone can be differentiated from one another. The manner in which the follicles are formed from these epithelial strands has been already pointed out (p. 37).

Formed originally in the lumbar region, the ovary descends into the pelvis. Its descent is brought about by the formation of a fold, the *plica gubernatrix*, which runs downwards into the groin. Later muscular tissue appears in this fold, and by muscular contraction the ovary is pulled down into the pelvis. The plica gubernatrix is represented in the adult female by the round ligament of the uterus.

In connection with the Wolffian body two ducts are formed: the *Wolffian duct* upon its outer aspect, the *Müllerian duct* upon its inner aspect; these are, of course, paired organs. Of the former only rudiments survive in the adult female; from the latter are developed the Fallopian tubes, the uterus, and the vagina (fig. 45). The anterior end of the Wolffian body, together with a part of the upper portion of the Wolffian duct, form the parovarium (epoöphoron). The lower part of the duct may persist in the form of a vestigial tubule which runs along the lateral aspect of the uterus and vagina nearly to the vulva; this is known as *Gartner's duct*, and may give rise to the formation of cystic tumours in adult life (see p. 371). According to Keith and others, the abdominal ostium of the Fallopian tube, the hydatid of Morgagni, and the structures described on p. 44 as Kobelt's tubes, are developed from the pronephros, and therefore are not Wolffian structures at all.

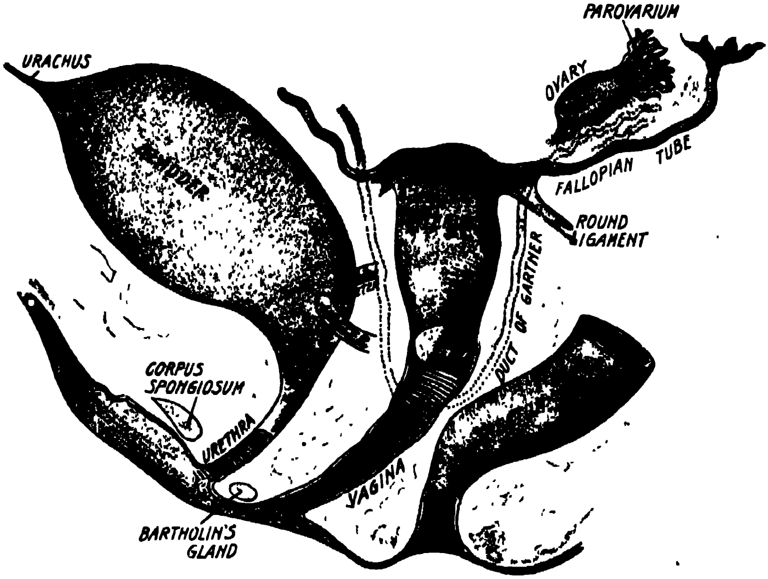

FIG. 45.—DIAGRAM OF THE FEMALE TYPE OF SEXUAL ORGANS (Allen Thomson in 'Quain's Anatomy').

from
pronephros
— 1 Abdominal ostium
2 Kobelt tubes
3 Hydatid Morgagni

The Müllerian duct is closely related throughout its course to the Wolffian duct. Up to the second or third month, both ducts may be found running in company along a band of tissue known as the *genital cord.* At a point some distance from their upper ends the Müllerian ducts cross the Wolffian ducts to meet one another in the mesial plane, the latter then, accordingly, lying outside them. At a later period the approximated portions of the Müllerian ducts fuse forming a single tube, but they remain distinct above the point at which they crossed over to the middle line. The upper portions, which remain distinct, form the Fallopian tubes; the lower portions, which fuse, form the uterus and the vagina. The lower end of the fused ducts opens into the *urogenital sinus.*

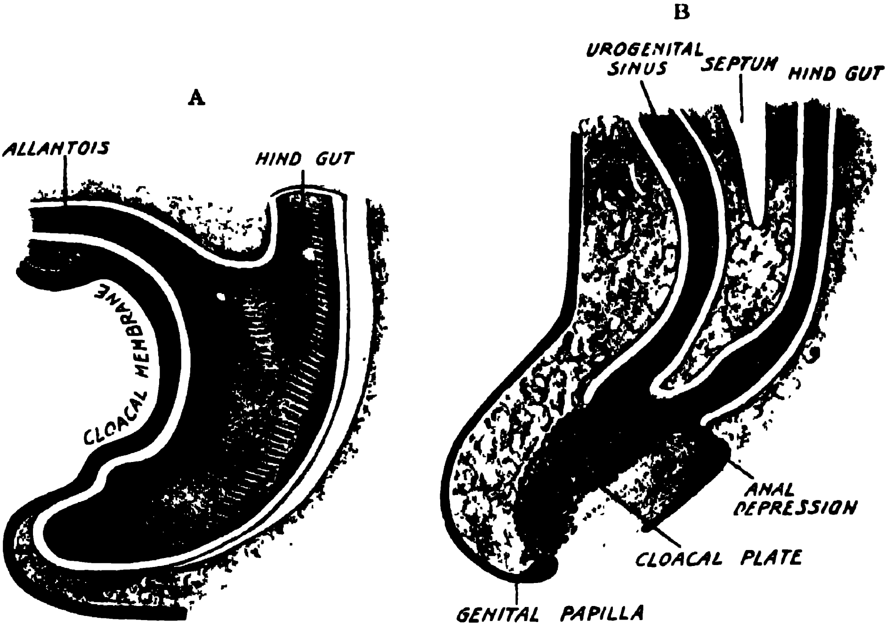

FIG. 46.—DIAGRAM REPRESENTING TWO STAGES IN THE DEVELOPMENT OF THE CLOACA (Bryce in 'Quain's Anatomy').

The development of the *vulva* is intimately associated with the changes which result first in the subdivision, and then in the disappearance, of the *cloaca* (fig. 46). In an early embryo the cloaca forms a large chamber situated at the caudal extremity, which is closed on its ventral aspect by the *cloacal membrane,* and into which the allantois and the hind gut open freely above. By the growth of a *septum* from the cephalic end of the cloaca backwards, it is divided into two channels—the posterior representing the *hind gut*, the anterior representing the *urogenital sinus*, into which open both the allantois (bladder) and the Müllerian ducts (vagina). When fully developed this septum reaches the surface posteriorly forming the perineal body.

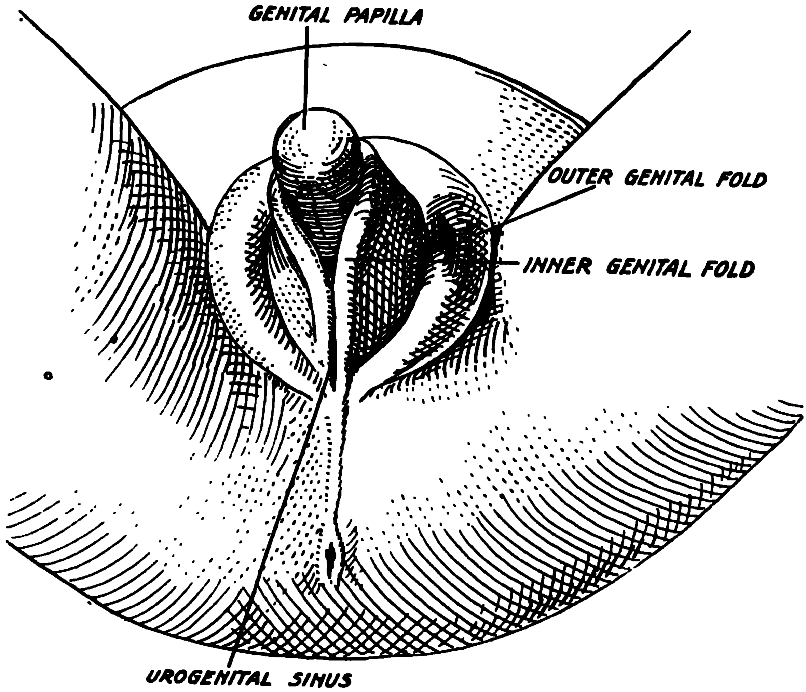

FIG. 47.—DEVELOPMENT OF THE EXTERNAL GENITAL ORGANS (Kollmann). Female fœtus of the eleventh week.

At the caudal extremity of the cloacal membrane a projection is formed—the *genital papilla*. Running backwards from this point, on each side of the cloaca, are formed two surface folds separated by a shallow groove—the *outer* and *inner genital folds* (fig. 47). From the former are developed the labia majora, from the latter the nymphae, while the genital papilla becomes the clitoris (fig. 48). The urogenital sinus becomes greatly shortened, and is indicated in the adult by the vestibule alone. It is in consequence of this shortening of the urogenital sinus that the urinary and genital canals come to open separately in the vulva.

The *hymen* is apparently developed from solid masses of epithelium, or *bulbs*, which are produced at the lower end of the Müllerian duct. There is some dispute as to whether they are actually Müllerian or Wolffian in origin (Berry Hart):

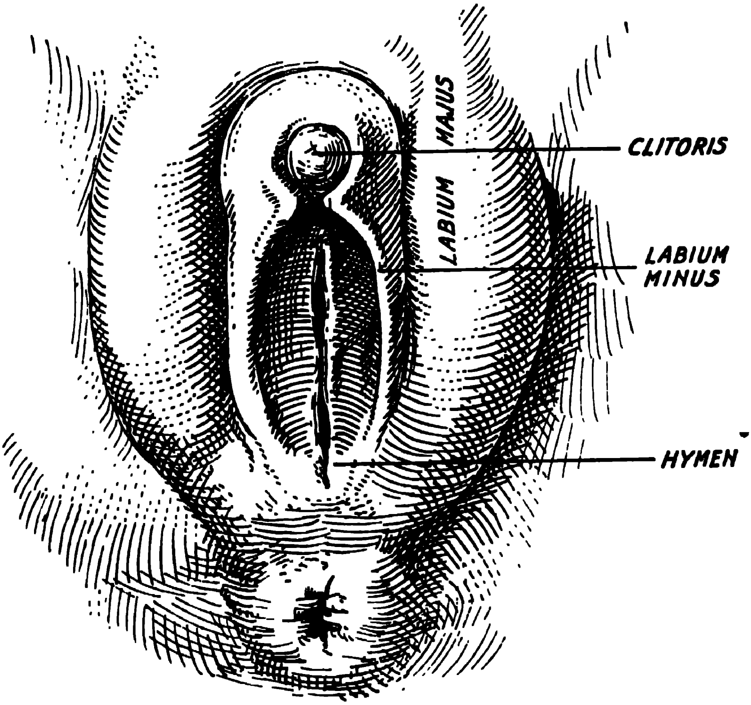

FIG. 48.—DEVELOPMENT OF THE EXTERNAL GENITAL ORGANS (Kollmann). Female fœtus of the sixteenth week.

At first they proliferate so as to fill up the lumen of the lower end of the vagina; later the central cells break down again, and so the normal hymeneal opening is formed.

## MENSTRUATION

Menstruation is a periodic hæmorrhage from the endometrium which usually first appears coincident ~~with puberty~~, and continues ~~throughout the fertile period of~~ life, i.e. until the climacteric has been reached. The age of commencement of menstruation in white women of the United States and

Canada has been recently investigated by Englemann, who from the data of 20,000 cases placed the average age at fourteen. Under the various climatic conditions found between Hudson's Bay and the Gulf of Mexico, this writer found very little variation in the time of onset of menstruation. *From Englemann's observations it appears that climate is of less importance than race, and the often expressed opinion, that in cold countries women begin to menstruate later than in hot countries, cannot be maintained.* Thus the negresses of Somaliland begin at sixteen, the women of the Arctic Indians at twelve and a half; but in India and Samoa menstruation begins early, and the first pregnancy often occurs at the age of twelve. In addition many factors of a general nature such as nutrition, surroundings, heredity, etc., come into operation, some retarding, others advancing the process. While the average age for European races may be regarded as fourteen, the limits of normal puberty must be placed a good deal wider than this, viz. from twelve to sixteen years. Many instances of precocious menstruation at ages of five to eight years are on record, but few of them can be accepted as true examples of the menstrual function, due care not having been taken to exclude pathological conditions. It cannot be doubted, however, that true cases of precocious menstruation sometimes occur, for a recent case has been carefully recorded by Nacke, in which regular menstruation, at intervals of four weeks, was established at the age of three and a half years, and the signs of puberty were all fully developed at the age of five years.

Each menstrual period lasts on an average four to five days, but many individual variations both in the duration and the amount of the hæmorrhage are met with: less than two or more than seven days may be regarded as abnormal; no definite standard of amount can be applied, but for practical purposes increase or diminution from what is usual in any given individual is of more importance than the actual quantity of blood lost. An amount which is normal for one woman may be excess for another. It is not infrequent for menstruation to become suspended for twenty-four hours or more, after which the flow returns and pursues its normal course. The menstrual cycle averages about twenty-eight days, but here again variations are encountered; in many healthy women it is twenty-one days only, in others it may be five weeks. Departure from the rhythm normal to the individual in question is the more important point. From the first onset, a year or two frequently elapses before

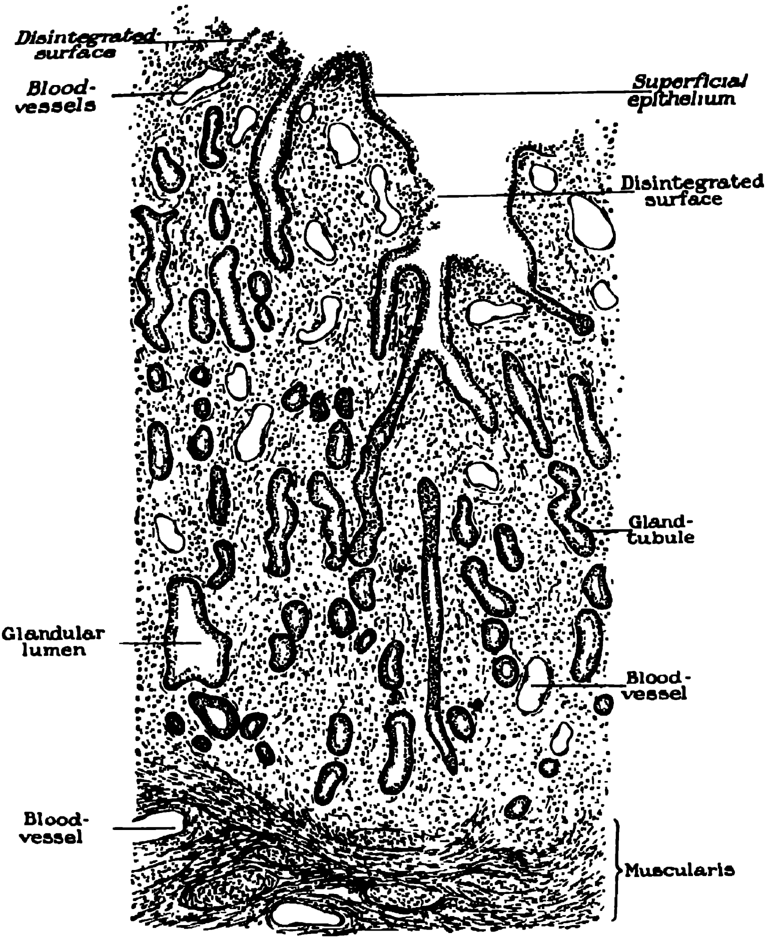

FIG. 49.—THE ENDOMETRIUM ON THE FIRST DAY OF MENSTRUATION (Schäfer).

the rhythmical character of the process becomes established; during this period the intervals are usually prolonged; sometimes, however, the early periods come too frequently, and are profuse and very painful.

The *anatomy* of menstruation has been recently studied by Gebhard, Sellheim and others in human uteri removed during a menstrual period. The earliest changes appear to be hyperæmia and swelling of the mucosa, associated with engorgement of blood-vessels, which is most marked in the superficial capillaries (fig. 49). The mucous membrane at this stage is dark red in colour, very soft and about 8 mm. thick. The glands become elongated and slightly dilated, presenting a somewhat spiral outline; the inter-glandular connective tissue increases in amount, becomes looser in texture, and sometimes shows increased infiltration with leucocytes. A little later small interstitial hæmorrhages appear, situated chiefly beneath the superficial columnar epithelium, and as a result patches of cells become thrown off; but the amount of tissue lost in this way is very small. It is uncertain whether the hæmorrhages are due to diapedesis, or to degeneration and rupture of the walls of the capillaries. The menstrual flow comes in part from the denuded patches, but probably the whole of the greatly congested mucosa bleeds more or less. There is no formation of large cells in the connective tissue, such as occurs in pregnancy. The mucous membrane of the cervix takes little or no part in these changes. If an ovum becomes fertilised, further important developments occur in the endometrium, resulting in the formation of the decidua of pregnancy; if not, the congestion subsides, the damaged surface is repaired, and the mucous membrane passes again into the phase of quiescence.

These changes may be conveniently divided into three stages or phases; (1) a stage of premenstrual congestion; (2) a stage of hæmorrhage; (3) a stage of involution or repair.

Along with these changes in the endometrium it is generally believed that congestion of the other pelvic organs occurs; and certain other changes certainly occur in the uterus itself, which can be readily recognised. Thus the cervix becomes a little softened, and the whole uterus becomes swollen, softened and tender; the cervical canal dilates a little during the flow, and there can be no reasonable doubt that this dilatation is brought about by contractions of the muscular walls of the body of the uterus (see p. 142). These changes form an important part of the mechanism of menstruation, for while the contractions of the uterine muscle serve to expel the menstrual fluid, the dilatation of the cervix facilitates its escape.

The menstrual fluid consists at first of mucus mixed with blood; later on of almost pure blood, especially in cases where the flow is profuse; and later still, towards the end of the process, of a brownish and sometimes slightly offensive fluid composed of mucus and altered blood. Epithelial cells from the vagina and sometimes others from the endometrium may be found in the discharge, which also contains an excess of leucocytes in the early stages. Sometimes recognisable portions of tissue may be found when the discharged blood is carefully examined under water; these are pieces of endometrium which have been shed and expelled (see Exfoliative Endometritis, p. 210). The expulsion of clots during menstruation is not an infrequent occurrence; usually they form in the vagina, and merely indicate that the flow is fairly free; the vaginal secretions retard coagulation when their proportion, compared with that of the blood, is adequate. It is probable that in abnormal instances clots form in the uterus, and their expulsion is attended by severe spasmodic pain.

The chemical composition of the menstrual discharge has received attention of late; Blair Bell has shown that it contains a much larger proportion of lime salts than does normal blood, and Gautier and Douser have shown that it contains a great excess of iodine. The significance of these peculiarities is not apparent in the present state of our knowledge.

The arrest of the menstrual flow is probably due to the muscular contractions by which the effused blood is expelled, and at the same time the blood-vessels are narrowed, or in the case of small ones, closed; congestion is thus progressively reduced, coagulation is initiated in the damaged areas of the endometrium, and the process of repair, thus begun, pursues its usual course.

*Symptoms.*—Hæmorrhage from the uterus is not the only symptom of menstruation. For several days preceding each period certain *premonitory* symptoms are often present, such as pelvic discomfort or actual pain, backache, headache, and more or less general malaise; in some cases excitability of temper or mental depression occurs; in others transient skin eruptions appear regularly during the premenstrual phase. This train of symptoms is regularly recognised by the patient as the precursor of the period. In other persons no premonitory symptoms occur, the period coming on without warning. In the first two or three days of the period the symptoms just described persist, and irritability of the bladder and sometimes painful micturition are also not infrequently met with.

It has been shown by numerous observations that during the premenstrual phase the pulse rate and the temperature are slightly elevated, the blood pressure is slightly raised, and the excretion of urea is slightly increased above the normal. During the menstrual period itself a fall occurs in each to slightly below the normal, and after the period is over a rapid return to the normal level sets in. These are indications of vaso-motor and, perhaps, of metabolic disturbances associated with the process.

The severity of the symptoms of menstruation is very variable in otherwise healthy women. Only a small minority appear to pass through the period without some suffering, and in many cases each menstrual period entails either a day or two of semi-invalidism, or at the least a good deal of restriction of activity.

The premonitory symptoms are probably due to the pelvic congestion induced by vaso-motor changes; it will be obvious that when local morbid conditions are present, especially those of an inflammatory nature, the symptoms attending them will tend to become aggravated before each monthly period, by the general premenstrual congestion of the pelvic organs.

**The Causation of Menstruation.**—Consideration of the causation of menstruation must start, at the present day, from the view that menstruation depends upon and is excited by the functionally active ovary. This view was suggested to the earlier observers by the clinical fact that the development of the sexual characters and the appearance of the menstrual function coincide at puberty, and that the sexually active period of life coincides with menstruation and ceases with it at the climacteric. Modern operative work has conclusively shown that the complete removal of both ovaries is invariably followed, either immediately or after a few months, in women who have not reached the menopause, by permanent arrest of menstruation. Apparent exceptions have been recorded by operators who have observed that the menstrual function has persisted after the alleged removal of both ovaries. Cases such as these may, however, be instances of incomplete removal of the ovaries; portions of the ovary are frequently left behind when dividing the pedicle, and a small amount of ovarian tissue thus left behind unnoticed at the operation may be sufficient to keep up the menstrual function. It is true that after complete double ovariotomy, menstruation sometimes continues regularly or irregularly for a few months before finally ceasing, but this fact does not invalidate the theory, as will be shown later on.

If it is granted that the menstrual process depends upon the presence of the functionally active ovary, the causative influence must be attributed to one of the two ovarian functions, viz. ovulation or internal secretion. It has, however, already been pointed out that the ovarian internal secretion is in all probability produced in the ripening Gräafian follicle and in the corpus luteum; accordingly, no clear distinction between these two functions can be drawn. For many years the view of Pflüger was generally credited, viz. that each menstrual period is reflexly excited by the pressure exerted by a ripening follicle upon the nerves of the ovarian stroma, from which it follows that ovulation and menstruation are practically coincident. This view has, however, been corrected by modern operative work, which has established the fact that ovulation occurs at times which are quite independent of menstruation. Ripe or ruptured follicles may indeed be encountered at almost all parts of the menstrual cycle; and further, pregnancy, which implies ovulation also, may occur at an age preceding the first appearance of menstruation, or in adult women when menstruation is temporarily in abeyance during lactation or other circumstances.

Even if ovulation and menstruation occur at independent times, it is quite possible that the latter process is initiated each month by the accumulation in the organism of an excess of the internal ovarian secretion. When the proportion of this substance reaches a certain point, it is possible that the anatomical changes described as occurring in the endometrium during menstruation are automatically initiated by biochemical processes. The regular arrest of menstruation in pregnancy, although ovulation continues, may be due to the production of a biochemical substance antagonistic to the ovarian secretion; and the persistence of menstruation for a few months after the removal of both ovaries may well be explained by the retention in the tissues of an excess of the internal ovarian secretion, sufficient in amount to maintain the menstrual process for a time.

Inasmuch as menstruation does not occur in animals with the exception of the higher apes, experimental control of the data upon which the theory of menstruation rests is almost impossible. A certain amount of light has, however, been thrown upon the question by Fraenkel, who first demonstrated that in rabbits, destruction of the corpus luteum with the galvano-cautery immediately after insemination, prevented the development of the fertilised ovum in the uterus, and thus caused abortion. Later he showed, by taking advantage of opportunities which offered themselves in surgical work, that destruction of the corpus luteum by the same method in women, delayed the appearance of the next menstrual period, and in some instances suppressed it altogether. He accordingly suggested that the corpus luteum is the part of the ovary which directly excites the menstrual period, probably through the medium of an internal secretion which is absorbed from it into the blood.

While the theory of Fraenkel requires corroboration before it can be entirely accepted, the facts observed by him, in so far as they are reliable, lend support to the view that the process of ovulation is the controlling factor in menstruation.

A theory entirely different from this has been advanced and advocated by Stevenson and others. These observers hold that ovulation and menstruation are quite independent, and that both are due to general metabolic processes which pursue a rhythmical course, rising once a month to points at which menstruation and ovulation respectively occur, these points being not necessarily identical. No clinical or experimental data can be quoted in support of this theory, which must be regarded as a scientific figment.

**General Management.**—Menstruation, though a natural process, is one which readily passes the border line and becomes abnormal. The due and regular occurrence of this function is undoubtedly an indication of good bodily health, while marked departures from the normal unfavourably influence the general health in most cases. At puberty care is accordingly called for until the menstrual function becomes properly established and its rhythm defined. Especially to be avoided under these circumstances are overwork in school tasks, 2 physical fatigue, and 3 exposure to cold or wet during a menstrual period. In later life the same precautions, though desirable, are not in all classes of society practicable. A chill caught during menstruation sometimes causes sudden arrest of the hæmorrhage, and following upon this acute pelvic pain, probably from unrelieved congestion. Such an occurrence may perhaps become the starting-point of inflammatory changes in the internal pelvic organs. In women who are habitually constipated the daily use of a mild aperient is indicated during the menstrual period.

## THE MENOPAUSE OR CLIMACTERIC PERIOD

Menstruation generally ceases at some time between the ages of forty-five and fifty ; it may, however, be delayed to the age of fifty-five or even later ; in other cases it occurs earlier, between forty and forty-five. There are three modes in which the menstrual function may come to an end : (*a*) it may terminate suddenly and finally without any preceding change being observed ; (*b*) the periods may occur at irregular and increasing intervals, with gradual reduction of the amount of bleeding, for some time, until it finally disappears completely ; (*c*) during the period of irregularity occasional profuse or prolonged losses of blood may occur. The duration of the period of irregularity is variable, and may extend over several years.

Accompanying these alterations in the menstrual function, certain general disturbances connected chiefly with the nervous system are very commonly met with. Occasionally these disturbances are entirely absent, but to the majority of women the climacteric is a time of more or less prolonged ill-health. The most characteristic, and at the same time the most troublesome, symptom consists in attacks of 'flushing.' The patient experiences the sensation of waves of heat passing over the whole body, often accompanied by visible congestion of the face and neck or other areas of the body, and followed in severe cases by profuse sweating. Each 'flushing' may last from fifteen to thirty minutes, or, on the other hand, may be almost momentary; several may occur in a day, or they may be much more infrequent than this; they appear to be especially severe at night. The mechanism of production of this vaso-motor disturbance is not known. Headaches, often severe and frequent, and neuralgias of various parts are not uncommon. Passing sensations of tingling or numbness in the hands and feet, or in other parts, are often complained of. Change of temperament in the direction of increased irritability, excitability or depression, and distaste for mental or bodily exertion are often met with. Many women further show a well-marked tendency to obesity at this time of life. These symptoms may persist for a long time after menstruation has entirely ceased, but their duration and severity are very variable.

The *artificial* menopause which ensues upon operative removal of both ovaries during the sexually active period of life closely resembles the natural process, and the attendant symptoms are often unusually severe. Arrest of menstruation by removal of the uterus, if one or both of the ovaries are retained, is usually almost entirely free from the attendant symptoms just described, but when both ovaries have also been removed these symptoms, as a rule, are unusually severe. Such clinical facts appear to indicate that these symptoms are induced by loss of the internal ovarian secretion rather than by arrest of the monthly hæmorrhage from the uterus.

Sometimes a *premature* menopause occurs apart altogether from operative interference, and a recent case has been recorded in which menstruation ceased naturally at the age of twenty-three, having begun at the age of eleven. A severe illness or a mental shock appears in some cases to have been the exciting cause; in others it has been due to lactational atrophy of the uterus; in others no cause has been discovered. It is accompanied by the usual symptoms, but does not lead to premature senility, or to atrophic changes in the genital organs.

*Anatomical Changes.*—Certain well-marked changes take place in the external and internal genital organs when the climacteric has been passed; they do not, however, appear immediately, and many women retain for a long time the outward signs of sexual activity. The labia majora slowly shrink from loss of subcutaneous fat, and the labial and pubic hair becomes less abundant, gradually disappearing as old age is reached. The nymphae become relatively prominent, and the skin of the vulva generally dry and somewhat polished in appearance. The stratified epithelium of the vulva and vagina atrophies, and small round patches of a dark red colour, apparently due to exposure of the deep epithelium, are often seen. The vaginal portion of the cervix shrinks and becomes less prominent, or may retreat until the lips of the external os are flush with the surface of the vaginal vault. The body of the uterus and the Fallopian tubes shrink; the endometrium in old women is found to be atrophied, and the greater part of the uterine muscle replaced by fibrous tissue; but for several years after the cessation of menstruation the endometrium may be found to retain approximately its normal characters (fig. 20). The ovaries also shrink and completely lose all their Gräafian follicles, and then consist mainly of fibrous tissue. Gradual disappearance of the follicles can be traced long before menstruation ceases. The connective tissue beneath the pelvic peritoneum to a great extent disappears, and the various ligaments become shortened and inelastic. The upper roomy part of the vagina becomes much diminished in capacity by shrinkage; sometimes irregular or concentric bands of dense fibrous tissue form in the vaginal wall, producing a constriction of the canal, or forming pockets in the vaginal vault. The mammary glands simultaneously atrophy and lose much of their fatty envelope.

The vaginal secretion of women past the menopause has no bactericidal properties, and owing to the imperfect closure of the ostium vaginae, foreign matters enter more readily than in the case of younger women. Infection of the secretions is accordingly more prone to occur, and this change is probably the main factor in the causation of the condition described as *senile vaginitis* (p. 484). The same changes may spread into the uterus, producing *senile endometritis* (p. 213).

**Treatment.**—The care of the general health in women who are passing through the change of life is, of some importance. The attendant symptoms do not require treatment unless they are unusually severe or prolonged, and then it must be admitted that we do not possess any remedies which can be relied upon to relieve them. 1 Ovarian extract ' given in the form of tabloids, or ' corpus lutein ' tabloids, sometimes appear to diminish the severity of the flushings ; in other cases 2 small doses of thyroid or thymus gland have proved useful. The use of 3 sedatives, alcohol, and analgesic preparations is to be discouraged, especially in women of neurotic temperament, for drug habits are readily acquired under these conditions. The occasional exhibition of small doses of bromide combined with valerian or with a vegetable tonic such as cinchona is, however, often useful.

Hæmorrhage and discharges at or after the menopause must in all cases be regarded as indications of the possible occurrence of malignant disease, the most likely seat of the disease being the cervix or the body of the uterus. A careful and complete internal examination must in all cases be made without delay, for successful surgical intervention is possible only in the early stages. The necessity for submitting to such an examination must be explained to, and urged upon the patient, who may at first be unwilling to allow it. In the great majority of cases a local cause will be found for irregular and protracted bleeding at the menopause, but sometimes, as has been already mentioned, this is not so. This matter will be again discussed in connection with the diagnosis of cancer of the uterus (p. 288).

# PART II

# METHODS OF EXAMINATION

## INTERROGATORY EXAMINATION

**The Patient's Previous History.**—In this connection there are certain points which are of especial significance in gynaecological cases. In the first place the menstrual function demands attention; the age of commencement, periodicity, degree of regularity, duration, amount, and attendant symptoms should be noted. Next the obstetric history, if any, should be taken, the chief points to be noted being the number of pregnancies, their dates, the occurrence of difficulties in delivery, and the length and character of the subsequent convalescence. The last-named point is of great practical importance, for a large number of cases of chronic pelvic inflammation arise from infection following either a confinement or miscarriage, and a prolonged or complicated lying-in period may be generally accepted as an indication of septic infection having occurred. The occurrence of a series of miscarriages is an important point in the obstetric history, for local morbid conditions are not infrequently found in such cases, and further, a miscarriage is almost as frequently followed by septic infection as a confinement. Other points of etiological importance are the presence of hereditary or personal indications of tubercle, the recent occurrence of any of the acute exanthemata with complications, and lastly, the possibility of venereal infection.

**The History of the Present Illness.**—Whenever it is possible to do so a clear history of the *onset* of the illness should be elicited. In chronic cases of long standing this is seldom practicable, partly from the patient's recollection being at fault, and partly from her want of observation. In recent or acute cases the relation of the first symptoms to the last preceding menstrual period, or the last preceding pregnancy, should be established by dates. In many diseases symptoms of considerable diagnostic importance appear at first, but being of brief duration, they are often not mentioned by the patient unless particular inquiry is made for them. As an example may be noted the scalding pain on micturition which accompanies the transitory acute urethritis of gonorrhœa. In cases characterised by attacks of acute pain particular inquiry should be made as to their relation to a menstrual period, and as to the occurrence of such menstrual alterations as delay, or increase in the amount of, the hæmorrhage. The importance of these points will be obvious in cases of pelvic inflammation and of extra-uterine gestation.

It will be found that the symptomatology of gynaecological disease is somewhat restricted. There are three important symptoms, viz. *hæmorrhage, discharge* and *pain*, which are met with either individually, or in various combinations, in a variety of different circumstances. The causation and significance of these cardinal symptoms will be considered in a later section; their incidence, their severity, their recurrence, and their special characters are subject to very numerous variations, the details of which should be noted in each individual case. Next in importance to these symptoms come disturbances of the function of menstruation, either in the form of alterations of rhythm such as increased or diminished frequency, alterations of amount—either less or more—and alterations of duration. The effect, if any, of a menstrual period upon the symptoms complained of should also be inquired into. Many minor symptoms are also frequently met with, such as sterility—either absolute or relative—pain or difficulty in sexual intercourse (dyspareunia), and disturbances of the function of micturition and, though of much less importance, of the function of defæcation.

The general health may be adversely influenced; thus severe hæmorrhage, sudden or prolonged, may lead to profound anæmia; malignant disease to wasting and cachexia; chronic pain to loss of sleep and appetite, to functional disturbances of the nervous system, or in some cases to aggravated forms of neurasthenia. It is to be borne always in mind that cases of the latter variety must be carefully discriminated from commencing disseminated sclerosis, a disease to which women are particularly prone, and which may on occasions be mistaken for hysteria, unless caution is exercised and the possibility of error recollected.

Care and judgment are required in estimating the value to be attached to the statements made by patients as to the severity of the symptoms of which they complain. This is especially the case with regard to pain, for many women unconsciously exaggerate this symptom ; in many others it bears the complex and variable characters which are associated with ' functional ' disturbances. In all cases less importance should be attached to the account of her sufferings given by the patient, than to the results of careful physical examination.

## ABDOMINAL EXAMINATION

The patient should lie upon her back with the body uncovered from the mammae to the pubes. *Inspection* will detect the presence of enlargement, its distribution and extent, skin markings, the condition of the navel and the degree of mobility of the parietes on respiration. Enlargement may be due to obesity, to the presence of fluid, to the presence of a tumour, to flatulent distension of the intestine, or it may be of the variety known as ' phantom ' enlargement. In the case of obese patients great care is required ; on the one hand a small tumour may easily be missed in such cases, while on the other the general enlargement may be wrongly attributed to a large tumour.

**Palpation.**—A certain amount of skill is required in successfully conducting an abdominal palpation. The hands should be warm, and in using them the whole hand should first be placed flat upon the abdomen, and lightly passed over the parietes, great gentleness being employed at first, especially in the case of nervous patients. The points of the fingers should not be used, but when pressure is required this should be applied with the whole hand or with all the fingers together. The patient meanwhile should breathe lightly and easily, keeping the mouth open. From nervousness many patients contract the recti muscles upon the lightest contact of the fingers, or maintaining the diaphragm in contraction, breathe solely with the thoracic muscles. To overcome this difficulty the patient may be directed to take rapid shallow respirations up to forty a minute, when the muscular tension is of necessity relaxed. An anæsthetic may, in some cases, be required before a satisfactory examination can be made.

When the abdomen is not enlarged and its walls are thin, it is sometimes possible to recognise the body of the normal anteverted uterus on deep downward pressure behind the symphysis pubis. A soft, ill-defined swelling, dull on percussion, in the hypogastric region, which prevents the hand from being pressed into the pelvic brim, suggests the full or distended bladder. The cæcum and pelvic colon when distended form soft tympanitic swellings in either iliac region, which should not be mistaken for any abnormal condition; when contracted these portions of the gut, in thin patients, can be rolled beneath the fingers, and feel solid and cylindrical in shape. Tenderness on deep pressure at a point about two inches above the middle of Poupart's ligament is so frequently met with, especially upon the left side, that it can hardly be regarded as abnormal except in a severe form; it forms one of the well-known 'stigmata' of hysteria, and though often referred to as 'ovarian tenderness,' its connection with the ovary is at least doubtful. On the right side its possible relation to appendicitis must be borne in mind.

The routine examination should also include palpation of the hypochondriac regions, for movable kidney is very common in women, especially upon the right side. When the abdominal walls are thin, a movable kidney may be readily recognised by the following manœuvre. When examining the right kidney the examiner stands upon the patient's right side and places his left hand upon the flank with the fingers behind in the ilio-costal space, the thumb in front along the costal margin. The patient is then directed to take a deep respiration; when the kidney descends with the diaphragm the thumb is depressed deeply below the ribs, while the patient allows the chest to empty itself. The kidney is thus detained below the ribs and can be palpated with the right hand, and its size, contour, and sensibility determined. Afterwards the pressure of the left thumb is relaxed, when the kidney can be pushed up again into its bed. In examining the left kidney the examiner stands upon the left side and uses his right hand.

The position of swellings or of areas of pain, increased sensibility or abnormal dulness, should be defined as accurately as possible for record. For this purpose the pelvi-abdominal cavity may be divided, as shown in fig. 50, into four horizontal *zones* named from below upwards—the pelvis, the hypogastric zone, the umbilical zone, and the costal zone. The hypogastric zone is limited below by the pelvic brim, above by the inter-tubercular plane, a horizontal line drawn between the highest points of the iliac crest. The costal zone is limited below by the sub-costal plane, a horizontal line joining the tips of the tenth costal cartilages, and above by the dome of the diaphragm. The pelvic cavity may be further subdivided by the intersection of its anterior and posterior diameters into four sections, which are named right and left, anterior and posterior sections respectively. Each of the abdominal zones may be further subdivided into three *regions* by two vertical lines drawn one on each side from the middle of Poupart's ligament to the costal margin. Nine regions are thus marked out upon the

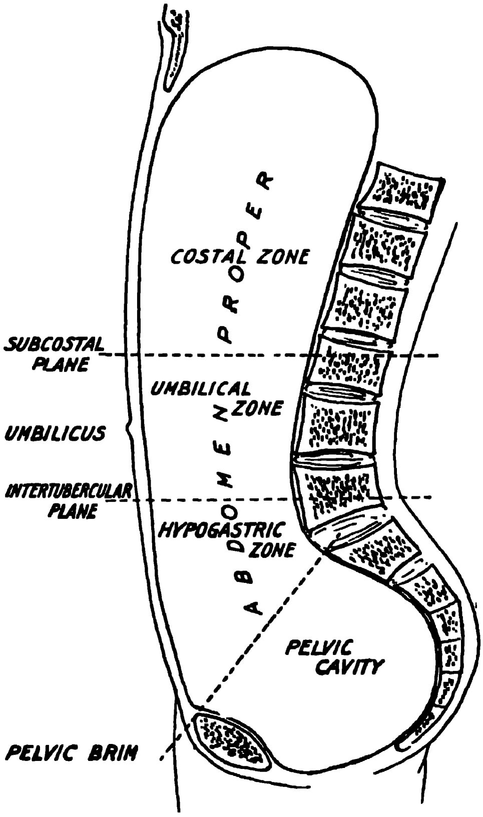

FIG. 50.—THE ABDOMINO-PELVIC CAVITY (Cunningham).

anterior abdominal wall which are named as shown in fig. 51. In the case of abdominal swellings of considerable size, it is well to state the horizontal zones in which they lie, and the regions which remain unoccupied.

When *general* enlargement of the whole abdomen is present the cause may be—(1) obesity; (2) ascites; (3) 'phantom' enlargements; (4) a tumour. *Obesity* will be suspected when the adipose tissue of the body generally is in excess; when giving rise to abdominal enlargement, the greater part of the excess of fat is in the abdominal parietes, the remainder in the omentum. The obese abdomen is flattened anteriorly, bulges in the flanks, shows no increase of tension, and the umbilical area is depressed to an unusual degree. The presence of a thick layer of subcutaneous fat can be demonstrated by taking up the abdominal wall in folds between the fingers. Firm percussion is required to bring out a resonant note from the subjacent intestines. Small abdominal tumours, in such conditions, may be readily overlooked even when great care is exercised. When deep palpation is rendered difficult by obesity, or by rigidity of the abdominal muscles, it is convenient to employ both hands, one superimposed upon the other. The fingers of the lower hand are then used for palpating, while the upper hand presses it deeply into the abdomen so as to overcome the parietal resistance. *Ascites* causes general enlargement of the abdomen only when the amount of fluid is great. An area of resonance persists around the umbilicus, and extends upwards through the epigastric region into the costal angle, while the flanks and lower abdomen are dull; the area of dulness shifts on change of position, as may be demonstrated by turning the patient on her side, when the upper flank will become clear; a fluid thrill is readily obtained from side to side by gently flicking the abdominal wall in the flank. Small amounts of free fluid in the abdomen may be very difficult to recognise when some other morbid condition is also present. *Phantom* enlargement of the abdomen occurs in women of neurotic or hysterical temperament, and is always recognisable by its complete subsidence under anæsthesia. Comparatively few *tumours* attain a size large enough to cause general enlargement of the abdomen, at all similar to the conditions just mentioned; that most commonly met with is an ovarian cyst, more rarely a fibro-cystic tumour of the uterus; hydatid cysts, and malignant growths in their advanced stages, may also be mentioned.

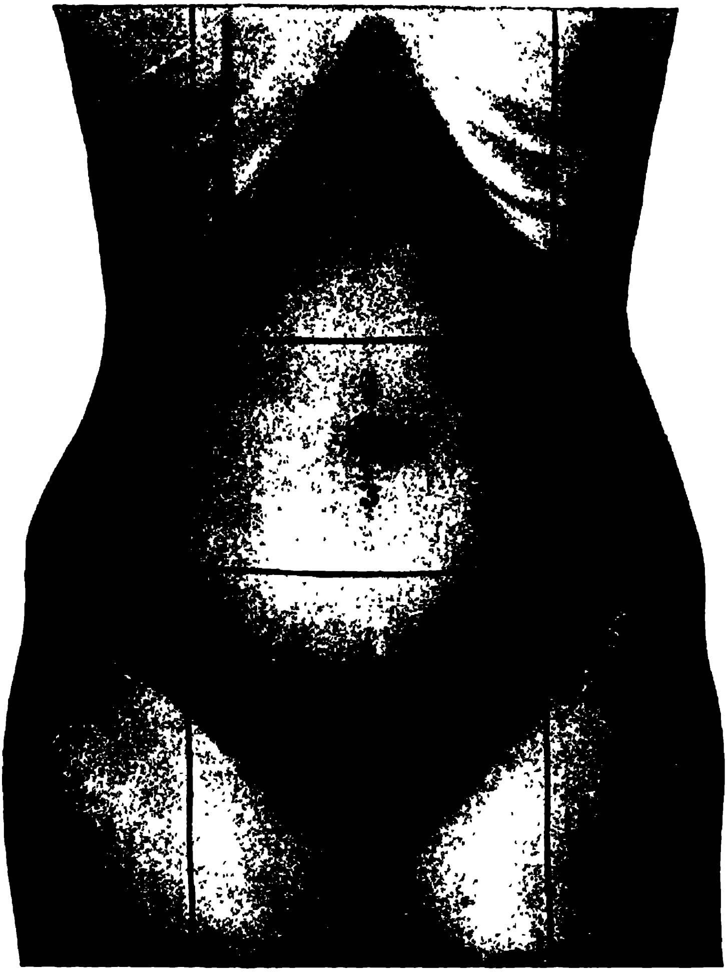

FIG. 51.—THE REGIONS OF THE ABDOMEN (Cunningham). 1, Right hypochondriac region; 2, epigastric region; 3, left hypochondriac region; 4, right lumbar region; 5, umbilical region; 6, left lumbar region; 7, right iliac region; 8, hypogastric region; 9, left iliac region.

When *localised* enlargement of the abdomen is met with, the possible causes are much more numerous and include morbid conditions of all the abdominal and pelvic viscera. Only those of pelvic origin can be referred to here. In the case of a tumour of *pelvic* origin rising into the abdominal cavity it is usually impossible to define its lower borders by abdominal examination; i.e. the fingers cannot be pressed down below it through the abdominal walls. Exceptions to this rule will be found in a pelvic tumour with a long pedicle which allows it to ride above the pelvic brim; such are either ovarian tumours, parovarian cysts, or subserous uterine fibroids. Pelvi-abdominal tumours with fluid contents, yielding a fluid thrill, are in almost all cases ovarian or parovarian cysts; in rare instances they may prove to be fibro-cystic uterine tumours. But in many cystic tumours no fluid thrill is found (see p. 382). These tumours are always dull to percussion; other swellings, such as a pelvic hæmatocele or an encysted peritonitic accumulation of fluid, are subresonant on account of the adherent coils of intestine which cover them. All tumours of pelvic origin are dumb to auscultation, except certain fibroids, which yield a souffle similar to that of the pregnant uterus.

## VAGINAL EXAMINATION

A complete vaginal examination of the pelvic organs is conducted by inspection and palpation, and also requires the use of certain instruments. Parts of the examination are often unnecessary and may be omitted, but it will be convenient to describe the methods here in full. In cases of venereal or septic infection boiled rubber gloves should be worn, both to protect the fingers from contamination, and to avoid the risk of carrying infective material to others.

The hands should be washed immediately before making the internal examination, and the fingers to be introduced into the vagina lubricated with sterilised or carbolised glycerine or vaseline or some similar material.

The position in which vaginal examination is usually made in this country is with the patient lying on her left side (fig. 58), with the thighs flexed on the abdomen. A high couch and a good light are useful aids. The examination can also be made with the patient lying on her back, with the thighs flexed, the feet supported on rests at the end of the couch, and the knees separated (fig. 53). In either position *inspection* of the vulva can be conveniently made, and this is the first part to which attention is directed. The points which should be noted are the condition of the labia majora, labia minora, and clitoris; then separating the labia with the fingers the hymen, carunculae myrtiformes, vestibule, meatus urinarius and fossa navicularis should be examined in turn; then, with the tip of the index finger introduced through the ostium vaginae, pressure should be made upon the floor of the urethra towards the meatus, so as to reveal the presence, if any, of urethral discharge; finally the openings of the Bartholinian ducts may be inspected and the glands may be palpated, when enlarged, by taking the tissues at the base of each labium majus between the finger in the vagina and the thumb externally. Generally the mucous surfaces of the vulva are moist, but there is no visible discharge; sometimes white curdy secretion or a thin opalescent fluid is present; neither is abnormal.

The next step is the digital examination of the vagina, which is usually made with the index finger, or in a parous woman the index and middle fingers, of the right hand. It is a great convenience to learn to use either hand indifferently for the internal examination. In introducing the fingers it will be remembered that the vulva presents an antero-posterior slit, while the lumen of the vagina is transverse; the hand will therefore be rotated through a right angle as the fingers pass upwards towards the cervix.

The condition of the *vaginal walls* is the first point to be observed; the transverse rugae (see p. 48) can usually be felt on the anterior wall, but in women who have borne several children, or in cases of prolapse, they are often absent. The educated finger will at once detect such conditions as abnormal laxity of the walls (in prolapse), constrictions, cicatrices, warty excrescences, and new growths, either cystic or solid. The *vaginal portion of the cervix* must next be defined. It lies usually about the centre of the pelvic cavity, the os corresponding to the level of the ischial spine; departure from this position is, however, by no means uncommon, and too much importance must not be attached to the slight displacements in one or another direction which may be met with, for the healthy uterus does not invariably lie in the middle line, nor at the same horizontal level. In nulliparous women the os forms either a small round aperture, or a narrow transverse slit; in women who have borne children it is invariably either transverse, if no laceration has occurred, or irregular if the cervix has been torn in delivery. Another condition which is not abnormal must also be borne in mind, viz. the presence of several low, smooth, round elevations upon the surface; these are caused by retention cysts formed in the substance of the cervix by closure and dilatation of the deep portions of the cervical glands—the so-called *ovula Nabothi*. The educated finger will detect such abnormal conditions of the cervix as dilatation of the canal, hypertrophic elongation and ectropion, protruding polypi—either cervical or uterine, and ulcerations due to malignant growths or to other causes.

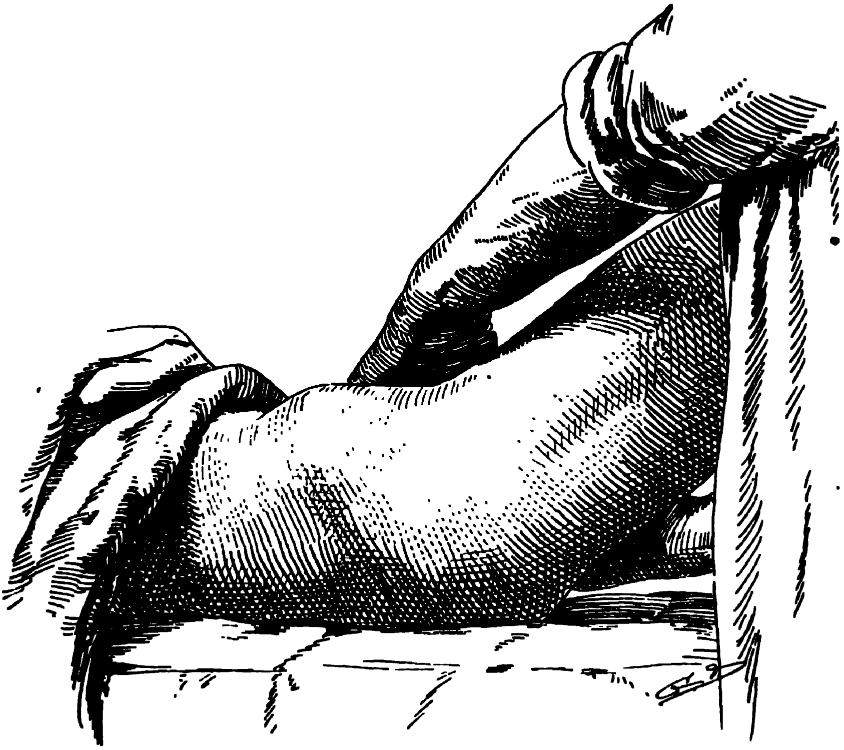

FIG. 52.—METHOD OF MAKING THE BIMANUAL EXAMINATION, the examiner standing at the side of the couch. (From a photograph.)

**Bimanual Examination.**—The next step is the *bimanual* *examination*, and this is the most important from every point of view. Considerable experience of this method is necessary to acquire confidence and skill ; under favourable conditions it is easy and permits of a detailed examination of all the pelvic organs ; under unfavourable conditions, such as obesity, nervousness, etc., an experienced clinical observer may be obliged to suspend judgment until an

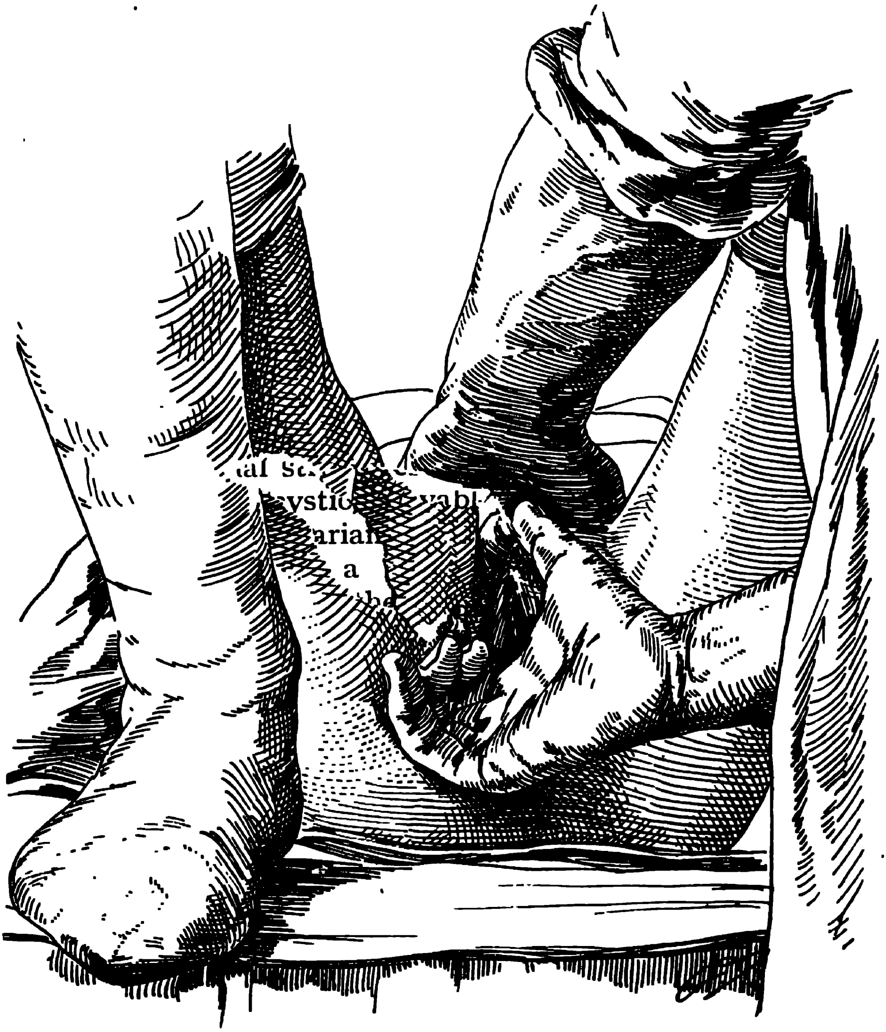

Fig. 53.—Method of making the Bimanual Examination, the examiner standing at the end of the couch. (From a photograph.)

examination under anæsthesia has been made, and even this in some instances may leave many points undetermined.

The only position in which the bimanual examination can be made is with the patient lying on her back, and the knees bent to an acute angle. When a special gynaecological couch or operating table is used the examiner stands between the patient's knees as in fig. 53; it is equally convenient, however, for the examiner to stand at the side of the couch, passing his right hand beneath the bent right knee of the patient (fig. 52), and for this method no special couch is required. The right hand is usually employed for the internal examination, the left is placed upon the hypogastrium, and with the fingers of the two hands working in conjunction, the pelvic organs can be palpated simultaneously from above and from below. It is advisable to become familiar with the use of either hand internally, for the right side of the pelvis can be explored more thoroughly with the right hand, the left side with the left hand. The examination should also be learned [illegible]ons shown in figs. 52 and 53; for the use of a [illegible]perating table is not always practicable, and in the [illegible]f patients confined to bed the position shown in fig. [illegible] is more convenient and occasions less distress than the other. It is essential for the bladder and rectum to be empty.

The body of the uterus is first to be identified, and it is naturally first sought in its normal position of anteversion. The uterus usually lies roughly in the obstetric axis of the pelvic cavity. In thin subjects it will be readily felt in this position; if not found at once, the vaginal finger should be used to push up the uterus towards the abdominal wall; this is much more effectual than attempting forcibly to overcome the resistance of the powerful abdominal muscles, by pressure with the external hand. When the body of the uterus is thus held between the fingers of the two hands, it is possible to determine its position, size, shape, consistence, and mobility; minor points also to be noted are sensitiveness to pressure, and pain provoked by movement. It is by no means easy to make a satisfactory bimanual examination of a retroverted uterus without first pushing it up to the level of the pelvic brim, and this can often be done more effectually *per rectum* than *per vaginam*.

The uterine appendages should be identified next, and these are found by bimanual examination of the *lateral fornices*. In those subjects who have lax abdominal walls, and who tolerate the examination without difficulty, three structures may be made out. Anteriorly a thin cord can be rolled between the fingers which represents the round ligament; behind this a thicker, cylindrical structure—the Fallopian tube; tracing the latter outwards the ovary may be felt in its usual position, i.e. close to the lateral pelvic wall; it will be recognised by its round or oval shape, soft consistence, and ready mobility, slipping easily between the fingers of the two hands. If the ovary cannot be felt in its normal position, it may be found prolapsed into the pouch of Douglas. In cases of obesity or rigidity of the abdominal walls, the unenlarged appendages may not be felt at all; when felt under such circumstances, they are probably of abnormally large size.

Many abnormal structures may be detected in the lateral fornices; a soft, cystic, movable swelling is generally an ovarian or a parovarian cyst; a hard, solid, movable swelling is generally a subperitoneal fibroid, but may be a solid tumour of the ovary; a firm or hard, fixed, tender swelling is generally inflammatory, and in the great majority of cases includes, as its nucleus, an inflamed tube or ovary, or both (salpingo-oöphoritis); less commonly this kind of swelling is due to an inflammatory effusion into the broad ligament (cellulitis). A loop of the pelvic colon on the left side, or a portion of the cæcum on the right, may sometimes be palpated in the lateral fornices, and may be felt to gurgle under the pressure of the fingers.

Lastly, the *posterior fornix* is explored in the same manner. The pouch of Douglas is usually empty, but under normal conditions may sometimes contain a coil of intestine, which may be felt to retreat or gurgle under the pressure of the finger. By pressing the internal finger upwards behind the cervix, a small portion of the posterior uterine wall in its lower part may be felt (fig. 2); the anterior rectal wall and the utero-sacral ligaments can also be felt, but the latter are not recognisable unless unusually well developed, or thickened by inflammatory or other changes. In all cases they can be examined much more effectually *per rectum* than *per vaginam*. Of all the structures which may, under abnormal conditions, be felt through the posterior fornix, the commonest is the body of the uterus in backward displacement, and next to this the ovary when prolapsed; other structures which may be encountered include such varied conditions as uterine fibroids, ovarian tumours (cystic or solid), inflamed or dilated tubes, intraperitoneal collections of blood or inflammatory fluids, displaced abdominal viscera such as the spleen or the kidney, new growths of abdominal origin such as carcinoma of the omentum or peritoneum, hydatid cysts of the pelvic cellular tissue, fæcal accumulations, and new growths or foreign bodies in the rectum.

In many cases great assistance will be obtained from conducting the examination both in the dorsal and in the lateral positions. The change of posture brings with it a change in the position of the principal pelvic organs, especially the uterus; in the lateral position this organ tends to fall forwards, and thus to allow a more complete examination of the region of the pouch of Douglas from below.

**Rectal, Recto-abdominal and Recto-vagino-abdominal Examination.**—Rectal examination is made with the index finger of the right hand, protected by a glove or rubber finger-stall, and freely lubricated before being introduced. A history of hæmorrhage or pain accompanying defæcation necessitates a careful inspection of the anus before the finger is introduced, for a digital examination may be extremely painful when fissures or peri-anal abscesses are present. Rectal examination allows of a more complete examination of the contents of the pouch of Douglas than does vaginal examination; the finger in the rectum passes far up the posterior wall of the pouch, while only its floor is accessible from the vagina (see fig. 4). The nature of a retro-uterine swelling can often be elucidated in this way. Further, the utero-sacral ligaments are readily felt, and early infiltration, as in cancer of the cervix, may be detected, although not apparent from the vagina. Again, effusions into the pelvic cellular tissue sometimes track round the rectum, surrounding it more or less completely with a firm fixed ring of induration. Lastly, conditions such as rectal stricture or polypi, hæmorrhoids, fæcal accumulations, and foreign bodies will also be detected. In the case of pelvic swellings it is sometimes useful to carry out a bimanual *examination from the rectum (recto-abdominal), either alone, or even more conveniently with the index in the vagina, the second finger in the rectum (recto-vagino-abdominal).* Slight degrees of mobility may be thus detected, and the relation of a pelvic swelling to the uterus may be defined.

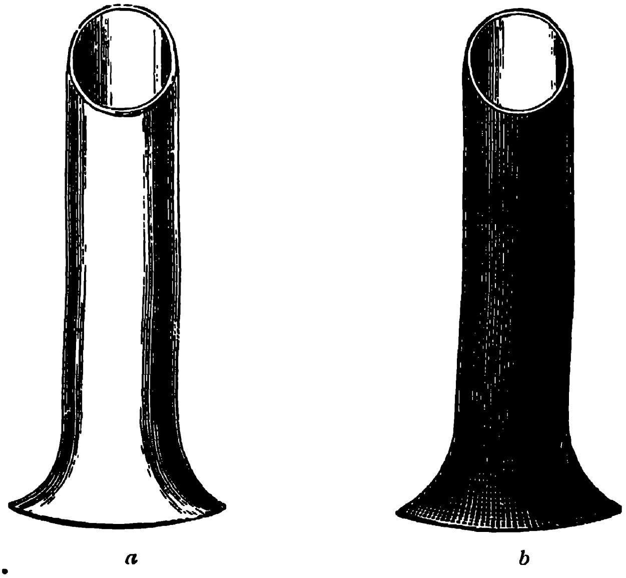

FIG. 54.—FERGUSON'S VAGINAL SPECULUM. *a*, Metal; *b*, mirror glass, coated with gutta-percha.

It must be understood that rectal examination is not an essential part of the routine investigation of a gynaecological case. Unless the rectum has been recently and thoroughly emptied it is of little value; accordingly some preparation is often required before it can be carried out. But its usefulness under the conditions indicated above is very great.

**Visual Examination of the Vaginal Walls and Cervix.**—With the aid of a vaginal speculum and a good light the vaginal canal and cervix can be conveniently inspected. There are many types of vaginal speculum, but only two need be described: the most useful is the *tubular* or Ferguson's speculum; next may be mentioned the *duck-bill* or Sims's speculum.

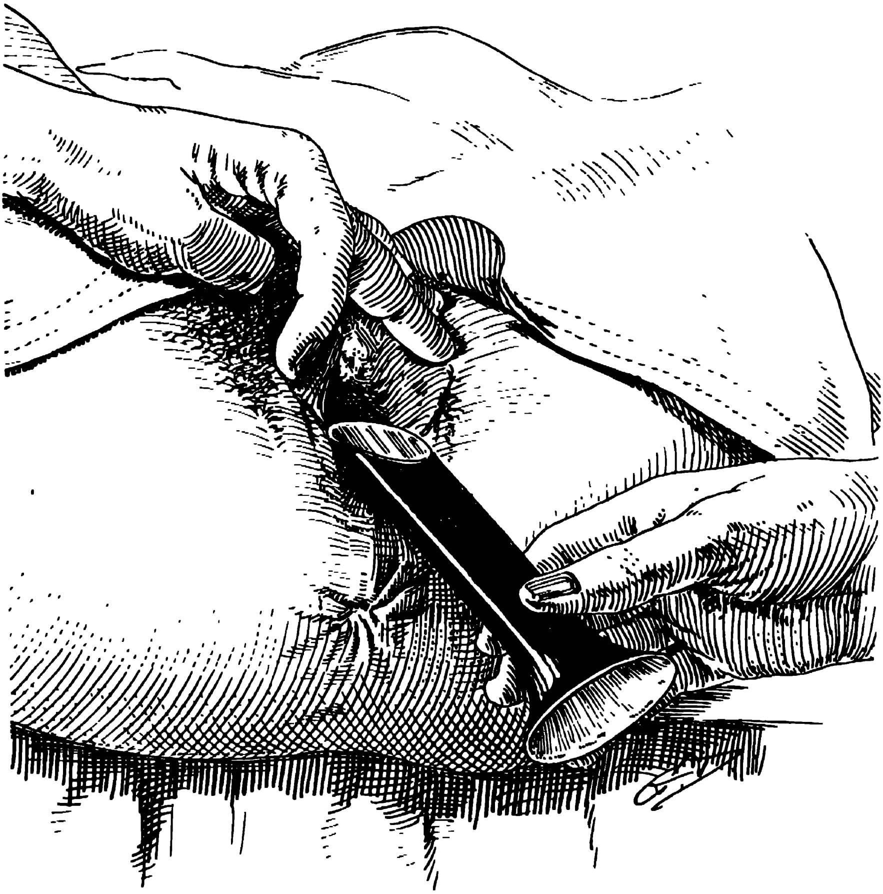

FIG. 55.—METHOD OF INTRODUCING FERGUSON'S SPECULUM. (From a photograph.)

Ferguson's speculum is a tube of glass or metal about six inches long, cut obliquely at its upper end, and furnished below with a shallow flange (fig. 54). It is made in different sizes; the smallest, suitable for a nulliparous woman, having a diameter of about one inch. The older type of this instrument is made of mirror glass coated externally with gutta-percha; good illumination is furnished by the reflecting

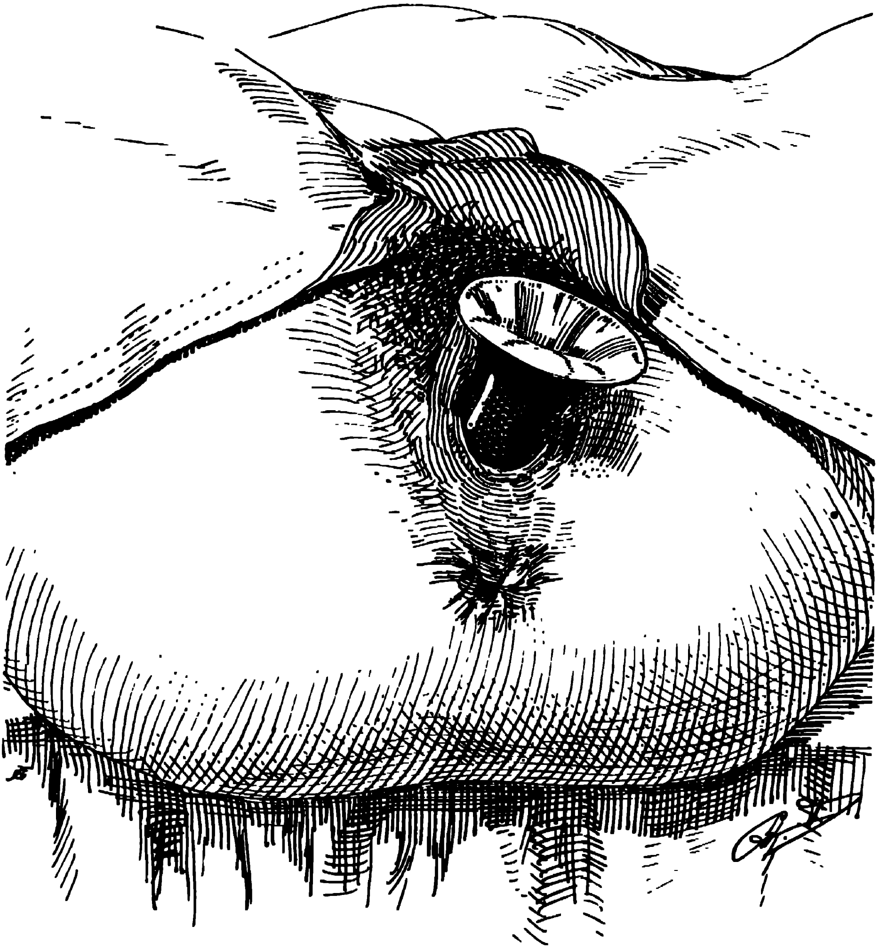

FIG. 56.—FERGUSON'S SPECULUM AFTER INTRODUCTION
(From a photograph.)

surfaces of this instrument, so that it can be used with little artificial light, but as it cannot be sterilised by boiling, it is unsuitable for general use. Frosted glass, aluminium, or nickel-plated metal are therefore to be preferred. In introducing the instrument—surgically clean and smeared with a sterile or antiseptic lubricant, the fingers of the left hand are used to separate the labia minora until the ostium vaginae can be seen (fig. 55). The upper, oblique end is then applied to the vulva, the longer side being posterior, and with the edge the posterior vaginal wall is gently pressed backwards; the lower end at the same time is so held that the instrument lies in the obstetric axis of the pelvic outlet. In this way the ostium vaginae is stretched until the short anterior side of the speculum will slip past the vestibule without the use of force. The instrument is then pushed gently inwards, the long side being directed behind the cervix into the posterior fornix; the cervix then lies exposed in the upper end of the speculum, and the vaginal walls are not seen. In introducing or withdrawing the speculum the vaginal walls beyond it can be seen in contact with one another, and thus are open to examination in their whole extent, a small portion at a time.

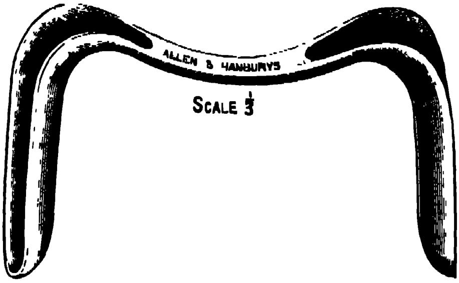

Fig. 57.—Sims's Vaginal Speculum.

This speculum can conveniently be used in either the dorsal or lateral position, and suffices for most of the arm carried behind her back and both thighs flexed, the right more acutely than the left (fig. 58). When, in this position, the ostium vaginae is opened, air enters the vagina and distends it, while the uterus falls forwards and downwards, i.e. towards the anterior abdominal wall. The spoon-shaped end of the speculum is then introduced along the posterior vaginal wall, and being gently pulled backwards, the whole of the anterior vaginal wall and the cervix become exposed and can be inspected under good illumination. When the vaginal walls are lax, as in cases of prolapse, the anterior wall falls into the instrument and obscures the view unless pressed back with forceps. This speculum is less convenient for general use than the tubular one, and often necessitates the presence of an assistant to hold it in place. For vaginal operations it is in common use, being then employed in the modified lithotomy position (fig. 243).

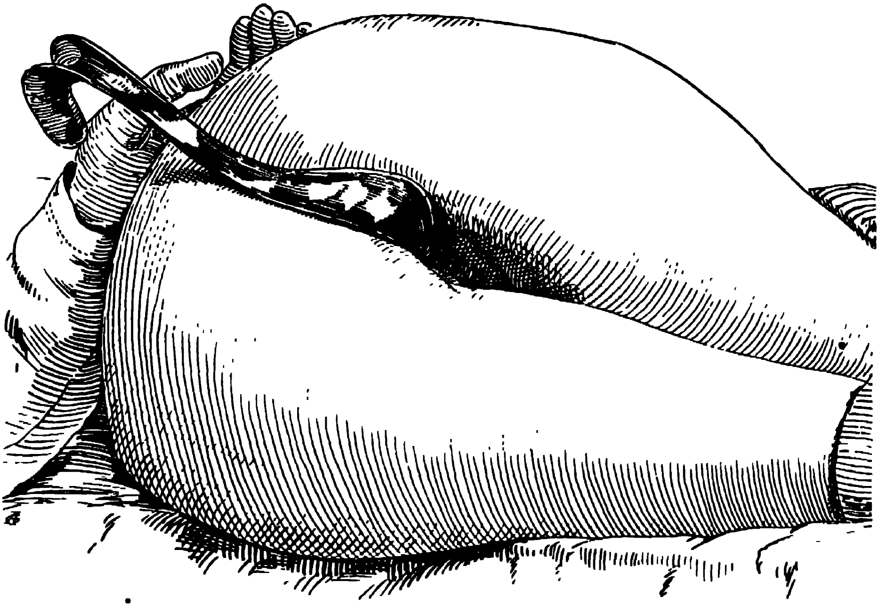

FIG. 58.—SIMS'S POSITION, WITH THE SPECULUM INTRODUCED. The hand seen at the back is the left hand of the patient. (From a photograph.)

This speculum can be readily sterilised by dipping it in methylated spirit, and then igniting that which adheres to the instrument.

**The Uterine Sound.**—This instrument is a probe specially designed for introduction into the cavity of the uterus (fig. 59). It is made of pliable metal so that it may be curved to suit abnormal conditions. At a point two and a half inches from the tip is a small knob, marking off the normal length of the uterine cavity; beyond the knob the sound is notched at intervals of one inch. Before being introduced into the uterus it must be surgically clean; this can be ensured by boiling it, or more rapidly by holding it for half a minute in the flame of a spirit lamp, or by dipping it in methylated spirit and then igniting the spirit which adheres.

There are two methods of introducing it, viz. the *direct* method, and the *indirect* method or *tour de maître*; the patient may lie either upon the left side or the back. In the *direct* method the instrument is held lightly by the handle in the fingers of the left hand, with the concavity of the curve directed forwards; the index finger of the right hand is passed into the vagina, and the tip of the sound directed along it, care being taken that the instrument does not come in contact with anything before entering the vagina. The handle of the sound is at first necessarily carried forwards somewhat in front of the perineum, so that the instrument at first enters in an upward and backward direction (fig. 60). When the tip reaches the cervix it is guided into the canal by the right index finger, and then by sweeping the handle backwards towards the perineum the sound passes forwards into the anteverted uterus (fig. 61).

In the *indirect* method the instrument is held in the same manner, but with the convexity of the curve directed forwards. When the tip has entered the cervical canal the sound is turned round so that the concavity is directed forwards, and this is done with a wide sweep of the handle along the line of the right thigh of the patient. In this way the point forms the pivot upon which the instrument turns, so that its position in the cervical canal is unaltered by the movement. If, on the other hand, the instrument should be turned by simply rotating the handle, the tip necessarily describes the arc of a circle ; the *tour de maître* obviates this disadvantage. Lastly, the sound is made to pass into the uterus by carrying the handle gently backwards against the perineum.

It is obvious that either of these methods can be reversed and made use of when the uterus is directed backwards instead of forwards.

Information can be obtained by the use of the sound with regard to : (1) the length and direction of the uterine cavity ; (2) the presence of dilatation (as distinct from elongation) of the cavity, by gently rotating the handle of the sound when introduced, so moving the point through the arc of a circle ; (3) the presence of roughness or inequalities upon the uterine walls ; (4) the approximate width of the corporeo-cervical angle ; (5) the relation of the uterus to a pelvic tumour, when the position of the former cannot be made out by digital examination alone. The presence of a streak of blood upon the sound on withdrawal does not indicate anything abnormal, but considerable hæmorrhage is a sign of disease.

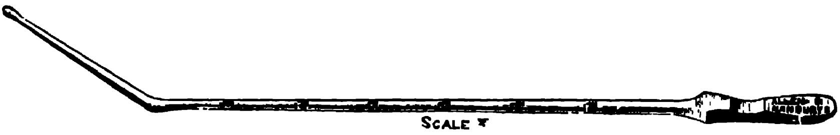

FIG. 59.—THE UTERINE SOUND.

The passage of the instrument through the cervical canal is generally painless, but a painful sensation is often produced by contact of the tip with the mucosa at the fundus.

Certain dangers attend the use of the sound which must be borne in mind. Primarily there is the risk of infection, either through a septic instrument, or through septic matter being picked up and carried from the vagina or the cervix into the uterine cavity. The latter is especially liable to occur in gonorrhœal or septic infection of the vagina or cervix ; and as a general rule the ~~sound should not be used~~ when/an offensive discharge from those parts is present, or when ~~gonorrhoeal infection~~ is suspected. If a menstrual period is overdue, suggesting the possibility of early pregnancy,

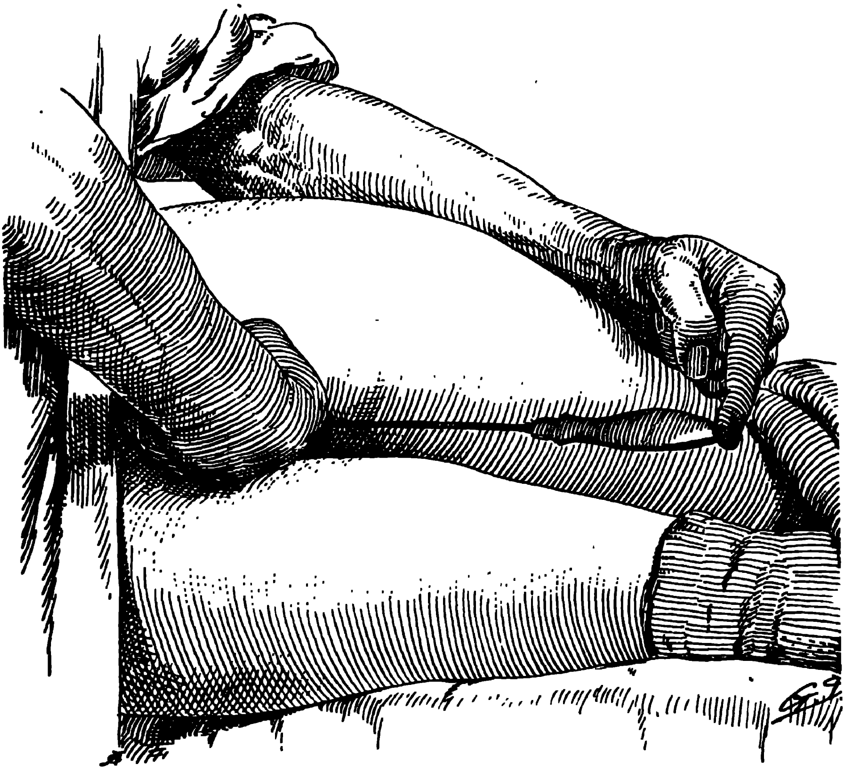

FIG. 60.—DIRECT METHOD OF INTRODUCING THE SOUND, FIRST STEP. (From a photograph.) The point of the sound is in the cervix. The instrument is being held so as to show its position and direction.

the use of the sound should be avoided. In certain conditions such as malignant tumours of the body of the uterus, 4 the friable walls ~~are easily perforated~~, and this accident under such conditions entails grave risks of septic peritonitis. Accidental perforation of the healthy uterus by a sterile sound has been known to occur without any harm resulting.

The sound is an instrument which is seldom employed by an experienced gynaecologist; most of the information obtained by its use can also be gathered from a bimanual examination, and the more expert the practitioner becomes in the use of the latter method the less frequently will he resort to the use of the sound.

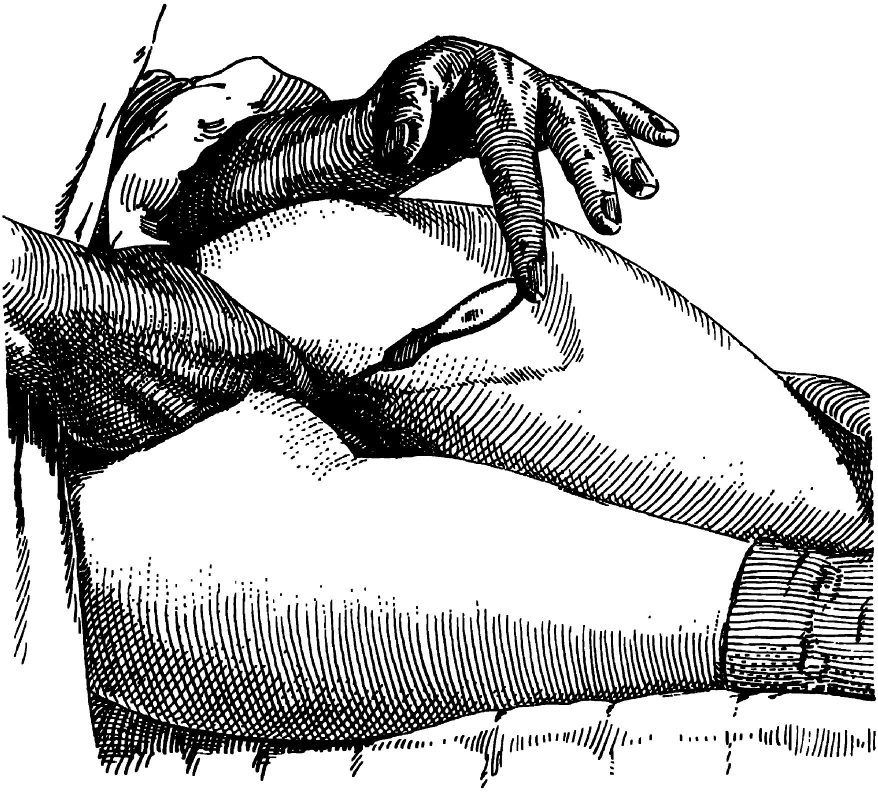

FIG. 61.—DIRECT METHOD OF INTRODUCING THE SOUND, SECOND STEP. (From a photograph.) The point has passed into the uterine cavity.

**Examination of Discharges, Tissues, etc.**—It is obvious that the complete clinical examination of a gynaecological case may entail the microscopic and bacteriological examination of discharge, or of pieces of tissue removed for histological diagnosis. This work is best entrusted to a clinical laboratory.

**Examination of the Urinary System.**—Such conditions as functional disturbances of micturition, cystitis, foreign bodies in the bladder, prolapse of the bladder, vesical fistula, and movable kidney come frequently under the notice of the gynaecologist, and are often associated with lesions of the genital canal itself. Such clinical methods of investigation as cystoscopy and catheterisation of the ureters may then be required, but for a detailed description of these matters other works should be consulted.

# PART III

## CERTAIN PROMINENT GYNAECOLOGICAL SYMPTOMS

Certain symptoms which are of frequent occurrence under varied conditions, may be conveniently considered individually as regards their clinical significance and treatment. Reference to them in connection with particular diseases can then be simplified and shortened. They are:

1. Hæmorrhage.
2. Discharge.
3. Pain.
4. Disturbances of micturition.
5. Dyspareunia.
6. Sterility.

### HÆMORRHAGE

Hæmorrhage is a symptom frequently encountered in diseases of the female pelvic organs. In a preponderating majority of cases its source is the uterus; it may, however, arise from disease of the vaginal walls, or the vulva. Severe bleeding is nearly always uterine in origin; vaginal and vulval bleeding, except when due to traumatism, is always slight. Bleeding from the rectum is very seldom, if ever, due to disease of the genital organs, and therefore will not be considered here.

In hæmorrhage from the *body of the uterus* the actual source of the bleeding is usually the endometrium; when it comes from the *cervix*, either the cervical endometrium or the stratified epithelial surface may be the actual source.

In rare instances, blood escaping from the uterus may actually spring from the Fallopian tubes, as in tubal cancer (p. 400). Hæmorrhage from the endometrium may occur either as an excess of the regular menstrual loss, or as an irregular bleeding in the intervals. Thus has arisen the time-honoured distinction between *menorrhagia* (the former) and *metrorrhagia* (the latter). This distinction is, however, of little practical importance, for one variety passes insensibly into the other and the same conditions give rise to both. Before puberty and after the menopause all bleeding from the uterus is spoken of as metrorrhagia. Bleeding from the cervix is characteristically intermenstrual, for the cervix takes no part in menstruation; but excessive menstrual loss may also be met with in such cases, owing to the presence of associated lesions in the uterine body. Hæmorrhage following coitus, except a first coitus, is usually cervical, and in the majority of cases is due to carcinoma.

**Hæmorrhage from the uterus** may be due to general or to local causes; when severe it almost always has a local, not a general, cause.

*General Causes.*—In all varieties of *anæmia* menstruation may be excessive; in chlorosis this is exceptional, in pernicious anæmia it is said to be comparatively common. In *acute infectious diseases* excessive menstrual periods or irregular hæmorrhages often occur. *Nervous shock, fatigue,* and *occasional alcoholic excess* may all cause uterine hæmorrhage, especially when the occurrence coincides with a menstrual period. It is often stated that *cardiac valvular disease* causes hæmorrhage, but a systematic examination of a series of heart cases does not support this view (Gow). *Hæmophilia,* a disease very rare in women, may occasionally be the cause of uterine hæmorrhage. *Puberty* and the *menopause* are often accompanied by profuse menstrual loss, and this without any discoverable sign of local lesions. After marriage an increase in the amount of menstrual loss is not uncommon, sometimes it becomes for a time profuse; it is no doubt attributable to the effects of *sexual excitement* upon the pelvic circulation.

*Local Causes.*—The subjoined list of morbid conditions giving rise to hæmorrhage is here given without detailed comment, as each will be considered in its place in a later section.

I. *Uterine* :

- A. *Body* (exclusive of uterine pregnancy)—
    - Extra-uterine pregnancy.
    - Subinvolution and retention of products of conception.
    - Chronic endometritis.
    - Chronic metritis or fibrosis of the uterus.
    - Mucous and fibroid polypi.
    - Submucous and interstitial fibroid tumours.
    - Adeno-myoma.
    - Backward displacement.
    - Chronic inversion.
    - Carcinoma, sarcoma, chorion-epithelioma.
    - Acute or chronic pelvic inflammation, e.g. salpingitis, peritonitis.
    - Increased intra-abdominal pressure, e.g. very large ovarian tumours.
- B. *Cervix*—
    - Mucous polypi.
    - Fibroid tumours.
    - Carcinoma and sarcoma.
    - Traumatic ulceration, as from a neglected pessary.
    - Tuberculous and syphilitic ulceration.
    - ‘Erosion’ (rarely).

II. *Tubal* (in rare cases) :

Interstitial tubal pregnancy ; tubal cancer.

III. *Vaginal* :

Lacerations ; carcinoma ; traumatic ulceration.

IV. *Vulval* :

Lacerations ; ulcerations ; rupture of varicose veins ; carcinoma ; urethral caruncle, urethral cancer.

In addition, it must be pointed out that a certain amount of evidence has recently been adduced which appears to indicate that bleeding from the endometrium may occur as the result of some perversion or morbid alteration of the internal ovarian secretion, evidenced anatomically by the presence of an excess of lutein tissue in the ovary. The possible influence of the normal internal ovarian secretion in inducing the recurrent bleeding of menstruation has been already mentioned; there is no great difficulty in supposing that abnormal bleeding may in the same way be set up by an abnormal or excessive ovarian secretion. Certainly, cases of uterine hæmorrhage are not infrequent in which no definite general or pelvic cause can be discovered, and it may be that further observation will show that some such cases may be due to ovarian influence.

The clinical significance of hæmorrhage varies greatly at different periods of life, and it will be convenient to indicate the morbid conditions which are most likely to be met with in the various phases of the development and decline of reproductive activity.

In *infancy* slight bleeding is not very uncommon in the first few weeks of life. Sometimes it is associated with mammary activity, the infant's breasts becoming tender, swollen, and full of secretion. It appears to be uterine in origin, and, except in premature infants, it is not of serious clinical import, and does not call for treatment.

In *childhood* hæmorrhage may indicate the precocious onset of menstruation (see p. 72); in other cases it may be due to malignant disease, the commonest forms at this period of life being sarcoma of the cervix and malignant growths of the ovary. It must also be recollected that pregnancy may occur before the establishment of menstruation, and may give rise to hæmorrhage.

In *adolescence* profuse hæmorrhage may characterise the first few periods which occur at the establishment of the menstrual function; thereafter the periods may become normal in amount and run a regular course, no local or general disease being discoverable. Chronic endometritis, sarcoma of the uterus, and malignant ovarian growths may all occur, giving rise to hæmorrhage.

In the period of *reproductive activity* (fifteen to forty-five years) the commonest cause of hæmorrhage is some disturbance of pregnancy; the possibility of this occurrence should never be overlooked, even when general considerations would appear to warrant its exclusion. Next to pregnancy the commonest causes encountered are fibroid tumours (including polypi), malignant growths of the uterus, and pelvic inflammatory lesions. Any of the other local and general conditions mentioned in the preceding list may also be met with. It must be recollected that in pregnancy, traumatic laceration of the vulva or vagina produce much more severe bleeding than in the non-pregnant state.

At the *menopause* profuse and irregularly occurring periods occasionally occur without any present indication or later development of local disease (see p. 79). The liability at this time of life to the growth of cancer in the body or cervix of the uterus is, however, so clearly established, that the most careful measures to exclude these conditions must in all cases be taken. Fibroid tumours sometimes occasion profuse climacteric hæmorrhages, owing to some degenerative change occurring in them.

After the menopause, in the *post-climacteric period,* the reappearance of hæmorrhage generally indicates carcinoma of the uterus ; more rarely the carcinoma will be found in the vagina or vulva. Occasionally senile endometritis, or a degenerative change in an old fibroid tumour, is the cause.

A certain amount of difficulty often arises in determining the degree of severity of the hæmorrhage, unless the patient is under observation at the time the bleeding occurs. Rapid recovery may apparently be made from the effects of recurrent, profuse monthly losses, and unless a blood count is made considerable degrees of anæmia may be overlooked. We should not wait until the patient is blanched before deciding that she is suffering from the constitutional effects of hæmorrhage, for chronic anæmia of moderate extent is often the starting-point of prolonged and intractable ill-health.

Generally speaking, *severe* bleeding indicates the presence of a local cause, and calls for a local examination. Exceptions to this rule may be recognised in the case of the profuse monthly losses sometimes met with at puberty, and the floodings which occasionally occur in the course of an acute infectious disease. Slight and continuous, or irregular bleeding is frequently due to a general cause; but in elderly women all hæmorrhages must be regarded as of grave significance, for they may be the earliest indication of the presence of a malignant growth. A glance over the conditions named above as local causes of hæmorrhage will show that bleeding as a rule must be accepted as indicating the necessity for a careful pelvic examination. It is better to examine and find no local disease, than to delay while local disease is present and advancing.

Local examination will be directed to the exclusion (*a*) of pregnancy, (*b*) of new growths of the uterus or vagina, (*c*) of inflammatory lesions, (*d*) of uterine displacements, (*e*) of slight degrees of enlargement of the uterus, indicative of chronic endometritis, or an intra-uterine polypus. The exclusion of pregnancy is the first and essential step. After this, difficulty in diagnosis is usually restricted to cases in which there is slight enlargement of the uterus, and beyond this nothing abnormal is found. In such cases digital exploration of the uterine cavity (see p. 571) is often required to clear the matter up. In rare cases profuse or even dangerous bleeding may occur from the uterus although no abnormality can be detected either on bimanual examination or digital exploration. These cases will be again referred to in connection with chronic metritis (see p. 215).

**Treatment.**—The *arrest* of bleeding from the uterus is a problem which is frequently encountered by the medical practitioner. If the uterus is gravid, the treatment is that of threatened or inevitable abortion, as the case may be, and this subject is dealt with in text-books of midwifery. In all other circumstances, treatment is governed more by the severity of the bleeding than by the local morbid conditions which may be present.

In all cases of *severe* bleeding from the uterus, rest in bed and free evacuation of the lower bowel are important, as by these means the pelvic circulation is to some extent relieved. The next consideration is the adoption of means to stimulate contraction of the uterine muscle, for this appears to be the natural mechanism by which in most cases bleeding from the uterus is controlled. There are three chief methods of attaining this result: (1) drugs, (2) hot douches, (3) the vaginal or intra-uterine tampon.

*Drugs.*—Two classes of remedies are employed in arresting uterine hæmorrhage: (*a*) general hæmostatics, which tend to control bleeding from any part of the body; (*b*) uterine hæmostatics, which exert a special influence in controlling bleeding from the uterus.

(*a*) Among the former may be mentioned salts of calcium, and preparations of the adrenal glands and the pituitary body. Salts of calcium, when taken in considerable doses and for a prolonged period, increase the coagulability of the blood and thus favour the arrest of bleeding by thrombosis. Their action is therefore prophylactic, and to produce this effect calcium lactate may be given in doses of five to ten grains three times a day; in cases of menorrhagia favourable results have sometimes been obtained when the drug has been taken throughout the menstrual intervals for a considerable time. The effect will only continue so long as the excess of lime salts in the body fluids is maintained.

Adrenalin or other extracts of the adrenals, when taken internally, accelerate the heart and produce a rise of blood pressure due to vaso-constrictor action upon small arteries; when applied locally they also produce a vaso-constrictor action which, while it lasts, diminishes or arrests local bleeding. It may thus be given internally in doses of 10–15 drops of a 1/1000 solution three times a day, or hypodermically in doses of 1 c.c. of a 1/1000 solution. Locally it may be applied directly to the endometrium or other bleeding surface (see below).

It has recently been shown by Blair Bell that the pituitary body exerts a general effect upon the circulation similar to that of adrenalin. In addition this substance, in animals, produces well-marked contraction of the uterine muscle. It is best administered by deep intra-muscular injection in doses of 1 c.c. of a 20 per cent. solution.

(*b*) The uterine hæmostatics which have been essayed in cases of hæmorrhage are very numerous.

Ergot has been in common use for many years, and is the best known and most reliable of all. Its influence upon the non-gravid uterus is, however, much less pronounced than that which is so readily produced by the obstetrician, and it must be admitted that only slight cases of bleeding can be controlled by its use. Further, in many slight cases, it appears to produce no decided effect, and must therefore be regarded as somewhat unreliable. Its effect is due to the influence it exerts in causing contraction of the uterine muscle. When given by the mouth large doses should be administered, e.g. 30–60 minims of the liquid extract three times a day, or a grain of ergotin in pill, and in cases of menorrhagia its administration should be begun a day or two before the period is expected, when menstruation is sufficiently regular to admit of this. It may be usefully combined with strychnine or with a dilute acid. Given by deep intra-muscular injection into the buttock or thigh, e.g. 10 ♏ of Injectio Ergotini hypodermica B.P., its effects will be more quickly and certainly obtained. Many special preparations or derivatives of ergot are obtainable, and among these Ernutin may be mentioned; it is best administered by deep intra-muscular injection. Stypticine, an opium derivative, may also be favourably mentioned; it is given hypodermically in doses of 1–2 ♏ of a 10 per cent. solution. Hydrastis may be given by the mouth as liquid extract (dose 30–60 ♏), or in pill as two grains of the dry extract. Hydrastis and ergot may usefully be given in combination either in mixture or pill, their administration being begun a day or two before the expected hæmorrhage. Styptol, a comparatively new remedy, is a derivative of one of the opium alkaloids (cotarnine), and is given in doses of 1–1½ grains several times a day. It is a very useful remedy, and is probably more reliable than any of the preceding. In addition to its hæmostatic action it produces a slight sedative effect.

Besides their specific action on the uterus, these three drugs are all vaso-constrictors, and produce some narrowing of the small arterial vessels of the body generally.

*Hot Douching.*—Douching the vagina with hot water at a temperature of 115°–120° F. is very commonly practised as a means of reducing hæmorrhage. It is doubtful if a hot douche is of much value as a uterine hæmostatic, unless applied to the interior of the uterus, when its effect becomes at once evident. This method can, however, seldom be used in gynaecological work, except after operative procedures and when the cervix is dilated. The vaginal douche is useful as a means of cleansing the canal, and if not markedly successful as a hæmostatic, it does no harm. Normal saline solution, or dilute solutions of antiseptics, or astringents should be used (see p. 615).

*Plugging.*—Plugging the vaginal canal when properly applied is the most efficient means we possess of controlling bleeding from the uterus. Double cyanide or sterilised gauze, in a single long strip, is the best material for the purpose, and it should be passed, after douching, with the aid of Sims's speculum, by which the perineum is pulled back and the vulva opened. The strip is first pushed up along the posterior vaginal wall into the posterior fornix, which is tightly filled, and then the lateral and anterior fornices are filled in the same way; the lower part of the vagina is only loosely filled. The plug should not be allowed to remain for more than twenty-four hours, but it can be renewed after douching if necessary.

Plugging the uterine cavity is seldom practicable owing to the narrowness of the cervical canal. Sometimes, however, a strip of gauze can be pushed up to the fundus, and in such cases it is useful to soak the gauze previously in a 1/1000 sterile solution of adrenalin. The local hæmostatic action of this substance is then added to the excitant effect of the plug upon the uterine muscle.

*Atmokausis.*—This procedure consists in the application of superheated steam to the uterine cavity, led in and out through a double-channelled tube, carefully insulated where it comes in contact with the vaginal walls and cervix. The endometrium is destroyed by the process, and as extensive thrombosis of vessels occurs, bleeding is for the time impossible. No check can, however, be placed upon the action of the steam, and the destruction of tissue sometimes proceeds much further than is intended. Thus sloughing of the muscular wall of the uterus, and sometimes complete atresia from adhesion of the denuded walls of the uterine cavity to one another, have occurred. For these reasons the method is not to be recommended for general use.

## DISCHARGES

A discharge from the vagina is common, and is not in all cases a sign of disease. In other cases it is an important sign, and it will, therefore, be useful to consider the various kinds which may be met with in relation to their origin and their significance.

The characters of the natural secretions must first be borne in mind. The Bartholinian glands secrete a clear, colourless, slightly acid fluid, which in some cases can be observed welling up from the openings of the ducts on examination of the vulva. The vaginal walls produce a secretion which, even in healthy conditions, is variable in character. In nulliparous and virgin women it usually consists of a white semi-solid material of the consistence of smegma, flaky in appearance and acid in reaction. In parous women it is usually more fluid in consistence, milky in appearance, and neutral or alkaline in reaction. The cervical secretion is fairly abundant, and of the appearance and tenacious consistence of white of egg; it is definitely alkaline in reaction. The secretion from the endometrium and the tubal mucosa is scanty and unimportant.

Four types of 'discharge' may be described.

1. An *excess of the natural secretions.* This may take the form of a thick milky discharge, or of strings or pellets of thick, sticky cervical mucus. It is usually more abundant immediately after menstruation than at other times. To these discharges the name of *leucorrhœa* (literally a white flux) may with accuracy be applied; this name is often, however, somewhat loosely used to indicate discharges different in nature from these. Excess of secretion may be the result of slight catarrhal inflammation, but frequently no definite sign of disease is present and the condition is of no clinical importance. It is frequently met with in anæmia and other depressed conditions of the general health.

2. *Purulent* and *muco-purulent* discharges usually result from true inflammatory changes in the vulva, vagina or uterus; occasionally some neighbouring organ is its source; thus collections of pus from a pelvic abscess may be evacuated into the uterus or vagina. In the acute stages of gonorrhœal infection a discharge of yellowish-green, highly irritating pus occurs; in the later or chronic stages the discharge is paler and muco-purulent. Other forms of vaginitis and endometritis, and ulcerative changes in the vagina or cervix, also set up discharges containing pus.

It is sometimes difficult to decide whether a small amount of a purulent discharge comes from the vaginal walls or from within the uterus. The tampon test may then be employed. It consists in placing a clean cotton-wool plug in contact with the external os, and leaving it in position for some hours; if a yellow discharge has come through the cervix, the plug will be stained where it lay in contact with the os, and not in other parts.

3. *Thin serous or watery-coloured* discharges are comparatively rare. They occur in the early stages of malignant disease of the cervix or uterine body; in the later stages of these diseases hæmorrhage and necrotic changes in the tumour tissues alter the characters of the discharge. Serous discharges are but rarely met with in any other conditions except pregnancy. The condition known as intermitting hydrosalpinx is said to give rise to this sign, but considerable uncertainty exists upon this point, which will be referred to again on p. 415. In tubal papilloma and tubal cancer a yellowish thin fluid often passes into the uterus and escapes as a vaginal discharge, but these diseases are very rare.

It must be borne in mind that attacks of urinary incontinence are sometimes mistaken by patients for a 'discharge.' Whenever the local conditions fail to explain such a discharge, great care should be exercised, and if possible a small amount of the discharge obtained which can be tested for urea; the presence of this substance can be detected in very small quantities, and may clear up a diagnostic difficulty. Urinary fistulae must not be forgotten in this connection, although their nature is usually self-evident and no diagnostic difficulty arises.

4. *Offensive Discharges.*—Discharges may become offensive from dirty personal habits, from the presence of foreign bodies in the vagina, and from necrotic or ulcerative changes in tumour tissues or in the walls of the genital canal; the pus from a pelvic abscess is usually offensive from the time of its first appearance. The morbid conditions most commonly associated with an offensive discharge are: (1) cancer of the cervix; (2) sloughing fibroids; (3) retained and neglected pessaries; (4) rupture of a pelvic abscess; (5) in the puerperium, infection of the uterine cavity.

**Treatment.**—When a discharge is complained of, its nature should be determined by direct observation, if there is any doubt as to which of the four classes it belongs to. Those of the first class do not form indications for local examination, and they require no treatment. Those of the other classes all necessitate an examination in order to discover their source and the nature of the lesion to which they are due; the treatment is determined by the local conditions which may be found.

## PAIN

Pain arising from diseases of the internal sexual organs is not characteristic either in its distribution or general features; it may be closely imitated in hysteria and neurasthenia when, as far as can be ascertained, the pelvic organs are normal. Consequently pain is not, as a rule, a symptom of any great diagnostic significance in gynaecology.

The parts in which pain is most commonly felt are the hypogastric zone of the abdomen, the spine from the lower lumbar region to the coccyx, and the front and inner aspects of the thighs. Epigastric pain, infra-mammary pain (especially frequent on the left side), and headaches are often regarded as 'referred' or 'reflex' pains of genital origin; the evidences in favour of this view are, however, not always convincing. Regions in which pain is felt are also often unduly sensitive or actually painful to pressure. Pain in the lower half of the trunk commonly attends the menstrual process; when occurring in the menstrual intervals its significance is greater than when occurring during menstruation. The severity of the pain in any given case depends in great part upon the ability of the nervous system to resist painful impressions. Some women are so intolerant of pain that they unconsciously exaggerate, describing as 'agonising' a degree of pain which another would support with but little effort. Great care must accordingly be exercised in dealing with this symptom.

The growth of tumours, whether innocent or malignant, is usually unattended by pain until, in the former case, the bulk of the tumour causes discomfort, or until, in the latter, ulceration of the primary growth or secondary invasions have occurred. Internal inflammatory lesions are all attended pretty constantly by pain, a characteristic feature being its liability to exacerbations which frequently coincide with menstruation. Acute pain of sudden onset attends pelvic peritonitis from infection, as in a case of suppurative salpingitis, and hæmorrhage from rupture or leaking of a gravid Fallopian tube (see p. 470). The causes of pain located on the right side of the abdomen are very complex, for the organ at fault may be the Fallopian tube or the ovary, the vermiform appendix or the cæcum, the kidney, or the gall bladder. Pain of neuralgic or neurasthenic origin is felt more often on the left side of the abdomen than the right, a clinical fact which it is very difficult to explain satisfactorily.

A movable kidney often gives rise to pain of an aching or dragging character, felt more often on the right side than the left; it is usually relieved by the recumbent position, and is sometimes associated with intermittent attacks of intense nauseating pain, which are attributed to kinking of the ureter causing transient hydronephrosis; they are known as Dietl's crises. Pain referred to the lower part of the back is very common in women, and is often very difficult to explain. Pain over the sacrum is often due simply to fatigue, and is almost invariably met with in neurasthenia; displacements—backward and downward—of the uterus, inflammatory pelvic lesions, a tumour occupying the pouch of Douglas, and carcinoma of the cervix in its advanced stages, cause pain in the same region. Pain localised to the region of the *coccyx* and felt chiefly when sitting, or in the act of rising from the sitting position, is sometimes met with (coccygodynia). Pain excited by movement at the sacro-coccygeal joint, or tenderness of the coccygeal ligaments, may also be present. Although coccygodynia occurs almost exclusively in women, it does not appear to bear any etiological relation either to child-bearing or to disease of the genital organs; it is probably of rheumatic origin.

One of the commonest varieties of pain met with in gynaecological affections is that described as 'bearing down pain.' This is a sense of weight, heaviness or fulness, referred to the pelvic cavity or its contents; sometimes it is associated, as in prolapse, with a protrusion from the vulva; more often it is dependent upon slight degrees of backward or downward displacement, slight enlargement of the uterus, or chronic inflammatory lesions.

Pain attending the menstrual process will be separately considered in the section dealing with *dysmenorrhœa* (p. 136).

## DISTURBANCES OF MICTURITION

The act of micturition may become abnormally frequent, or painful; sudden or gradual retention may occur; or urine may be passed involuntarily (incontinence), either continuously or occasionally, e.g. during coughing or sneezing. These symptoms, although usually due to disease in some part of the urinary tract or in the kidneys, are frequently the result of injury or disease in some part of the genital tract.

**Pain and Frequency.**—The number of times *per diem* the bladder is evacuated is to a great extent a matter of habit; women of nervous temperament frequently present slight degrees of this symptom in the day, but only rarely during the night; indeed, persons who suffer from distressing frequency during the day, often sleep all night without interruption. Nocturnal frequency is therefore always of more serious import than daytime frequency. When associated with pain during, or during and after, the act, the significance of frequency is increased.

Mental influences are notoriously powerful agents in disturbing the functions of the bladder and leading especially to irritability of that organ. Polyuria is one of the commonest signs of nervousness.

The first step in the investigation of such cases is an examination of the urine, which must always include the microscopic examination of the centrifugalised deposit. Uric acid or urates may be found, indicating a *gouty* condition, or albumen and casts may be found, indicating chronic *renal* changes, or sugar suggesting *diabetes*, or oxalates pointing to disturbance of *digestion*. The presence of pus may be due to urethritis, cystitis or pyelitis, or if the urine was passed naturally, to contamination by discharges from the vagina. Bacteriological examination and culture may be further necessitated in such cases.

Chronic bacterial infection may be present without any definite evidence of cystitis or pyelitis being found in the urine; consequently, if no other cause can be discovered, a specimen of urine should be taken with due antiseptic precautions against contamination, a sterile catheter being used and a sterile tube into which the urine may be run. Bacteriological examination may then show that bacillus coli infection is present, and this condition, when chronic, may give rise to an aggravated form of frequent and painful micturition.

It must be recollected that a movable kidney or a renal calculus, or certain diseases of the central nervous system, may also produce these symptoms in an aggravated form.

If nothing is found in the urine pointing to the presence of disease in the kidneys or any other part of the urinary tract, a local pelvic examination should be made, including a careful inspection of the vulva and urinary meatus, and exploration of the bladder with the sound.

The local conditions which may be present include the following: chronic cystitis or urethritis (usually gonorrhœal), bladder calculus, urethral caruncle or prolapse of the urethral mucous membrane, cystocele or prolapse of the uterus, pregnancy, a pelvic or abdominal tumour, and a pelvic inflammatory lesion. These conditions will all be described in later sections.

*Acute pain* on micturition is usually due either to acute cystitis or urethritis, to the passage of calculi, or to the presence of a vesical neoplasm.

The *treatment* must obviously depend upon the causal conditions which may be present; it is undesirable to endeavour to relieve these symptoms by sedative drugs until a thorough examination has been made in the endeavour to discover the cause.

**Retention** of urine may be due to hysteria, to the presence of some obstruction—usually outside the urinary tract altogether, or to reflex spasm of the sphincter or paralysis of the bladder.

*Hysteria* is a rare cause of retention of urine; mental disturbances usually pervert the bladder functions in the opposite direction. *Obstruction* causing retention of urine is seldom urethral, for stricture is very rare in the female. More often it is due to a pelvic tumour, the commonest conditions causing it being a retroverted gravid uterus, an impacted fibroid tumour, a pelvic hæmatocele or hæmatocolpos. These conditions will be considered in another place. *Reflex spasm* of the sphincter may be met with after the desire to evacuate the bladder has been too long resisted, after abdominal or vaginal operations, after child-birth, or from a very sensitive urethral caruncle which gives rise to severe pain during micturition.

The catheter may be resorted to in all instances except those due to hysteria, which should, if possible, be relieved by hot hip-baths, aided by a hot vaginal douche or an enema. When the use of the catheter has become necessary it should, however, be abandoned as soon as possible, to avoid the occurrence of cystitis, or permanent weakening of the bladder musculature.

**Incontinence** results from weakening of the sphincter. Not infrequently it is hysterical; it sometimes attends overdistension from retention; more often it occurs in parous women in whom there has been well-marked injury to, or relaxation of, the structures forming the pelvic floor; sometimes a vesico-vaginal or other urinary fistula is present; occasionally no local cause can be discovered. The bladder is usually evacuated involuntarily at the end of an epileptic seizure. Child-birth, and the injuries which often attend it, form the most important predisposing cause of this troublesome symptom. In slight cases the urine only escapes in small quantities during coughing, sneezing or severe muscular effort which raises intra-abdominal tension. In severe cases the escape is practically continuous during both day and night. Nocturnal incontinence in not uncommon in children, but rare in adults, and is sometimes due to local irritation such as vulvitis or the presence of threadworms; often no local cause can be discovered.

The treatment of *incontinence* can only be regulated by discovering the cause. In the case of the nocturnal enuresis of children, if no local cause of irritation can be found, careful education and general management, continued if necessary for several years, is the only method of cure; drugs are useless. Incontinence due to hysteria or to weakness of the bladder wall may sometimes be cured by local applications of electricity.

## DYSPAREUNIA (PAINFUL COITUS).

A variety of different conditions may render coitus painful and difficult to the female, and cases in which this symptom is present require careful investigation. The pain is seldom acute; usually it is described as of a dull aching character, and it may last for some hours after coitus has taken place. Dyspareunia is frequently associated with dislike or repugnance to sexual congress, to such an extent that in some cases nausea or even vomiting may be produced. Cases in which the dyspareunia commonly met with at the beginning of married life, persists, have a different explanation from those in which this symptom supervenes after a period of normal married life. In the former case it is on account of the dyspareunia alone that the patient seeks advice; in the latter case other symptoms are commonly associated with it. *Difficulty* in coitus, apart from pain, may be occasioned by such congenital abnormalities as imperforate vagina, and stenosis of the lower part of the canal.

In many cases a local cause can be found for this troublesome symptom, but not in all. In women of neurotic temperament dyspareunia may occur without any local morbid condition being discovered to which it can be attributed. It is then probably emotional in origin, and is scarcely amenable to medical or surgical treatment. The local causes of dyspareunia may be stated as follows:

*External Causes:*

- Acute and chronic vulvitis or vaginitis.
- Inflammation of the Bartholinian glands.
- Fissures and ulcers of the labia and ostium vaginae.
- Spasm of the ostium vagina—*vaginismus.*
- Tenderness of the carunculae myrtiformes.

*Internal Causes:*

- Inflammatory changes, acute or subacute, in the uterine appendages, peritoneum or cellular tissue.
- Backward displacement of the uterus, when complicated by adhesions, etc.
- Prolapse of the ovary.

Cases in which dyspareunia is a prominent symptom require in the first place a careful visual examination of the vulva, and in the next place a careful bimanual examination of the uterus and its appendages. The *treatment* is, of course, determined entirely by the nature of the local cause. When no local cause, external or internal, can be discovered, little can be done to afford permanent relief, but temporary alleviation may be obtained by the local use of a vaginal suppository or an ointment, containing five per cent. of cocaine or novocaine, half an hour before coitus takes place.

## STERILITY

Reproduction depends as much upon the normal sexual activity of the male as of the female ; sterility is therefore not due in all cases to the woman, although conditions which tend to produce it are much more common in the female than the male. Instances have occurred in which the marriage of perfectly healthy individuals has been unfruitful, yet in such cases the re-marriage of either has resulted in reproduction. Members of families with an average, or more than average, degree of fertility are themselves more likely to have children than those characterised by a lesser or a declining degree of fertility.

Sterility is usually described as of two kinds, *absolute* and *relative* : the former indicates persistent failure to conceive ; the latter, failure to carry pregnancy to a successful termination. Relative sterility is therefore an obstetric question and will not be further referred to here. The rule formulated by Matthews Duncan that the marriage of young persons between the ages of 20 and 30 cannot be regarded as sterile until 4 years have elapsed, should be observed in all cases. Instances have occurred in which a child has been born after from ten to fifteen years of sterile married life.

In considering the causation of sterility the general conditions which are favourable to the occurrence of conception must be borne in mind. Marriages between individuals of similar age and within the decade twenty to thirty show a high degree of fertility ; in earlier and in later years marriage is less fertile. Men of delicate health and sedentary occupation are less likely to procreate than robust men who lead an outdoor life ; the influence of the general health in women is less important than in men. It is generally accepted that women who suffer from dysmenorrhœa are less fertile than those who menstruate without excessive pain, a view which rests upon the careful statistical observations of Matthews Duncan, Vedeler and others. Consanguinity of married couples is often associated with sterility, although very numerous exceptions occur ; obesity, especially in the female, also tends to cause sterility, although its influence upon the reproductive function cannot be explained in the present state of our knowledge.

After passing these questions in review a local cause of the sterility may be sought for.

The conditions previously mentioned as causes of dyspareunia tend to prevent conception by interfering with the natural course of sexual congress. Certain congenital abnormalities absolutely prevent conception, such as imperforate vagina (see p. 130), infantile uterus, hypospadias and hermaphroditism (p. 530); others are believed to hinder but do not prevent conception, such as conical cervix and hypertrophic elongation of the cervix (p. 529). Small size of the os externum (so-called pin-hole os) may perhaps also unfavourably affect the prospects of conception. Uncomplicated displacements of the uterus do not form a serious hindrance to child-bearing, and numerous instances occur in which a retroverted uterus becomes gravid; at the same time, the correction of a backward displacement in a childless woman has been frequently observed to be followed by conception. Chronic endometritis, and fibroid tumours of the uterus, stand in the same category as displacements, although their influence is much more unfavourable. The infective forms of endometritis, whether corporeal or cervical, form an almost absolute hindrance to conception. Occlusion of both Fallopian tubes renders conception impossible; peritonitic adhesions involving the tube and ovary usually cause permanent sterility, but local recovery is not in these cases impossible. Bilateral ovarian tumours, when solid or malignant, destroy all the ovarian cortical substance and render conception impossible by arresting ovulation.

When no local abnormality can be detected in the wife, it is quite possible that the fault is with the husband. In all such cases it is desirable to see the husband and determine the absence of sexual weakness or incompetence; an examination of the semen should also be made, for sexual activity may co-exist with deficient vitality or absence of spermatozoa (azoöspermia). Chronic orchitis of gonorrhœal origin is not infrequently a cause of sterility in the male.

*Treatment.*—Certain general regulations are important in the treatment of sterility. Frequent sexual congress should be discouraged, and it should be pointed out that the week immediately following a menstrual period is the most favourable time for the occurrence of conception. A period of several weeks' separation of husband and wife is indicated if there has been excess, or if any sign of failure of sexual activity in the husband is detected. Abstinence from alcohol and tobacco should be prescribed, whenever there has been excessive indulgence in either.

Local causes of sterility in the female should be eradicated whenever their nature renders this practicable. If no local cause is discerned, and no male fault exists, the occurrence of conception may be aided by artificial dilatation of the cervix (see p. 569), the best time to choose being a few days before a menstrual period is due ; when the period is over the patient at once returns to her husband. The timing of the operation is a point of importance, for the effect of the dilatation should be made to coincide with the phase of the menstrual cycle in which conception is most likely to occur, i.e. the week following menstruation. Dilatation should not be performed unless the operator has satisfied himself that the physical condition of the husband is normal.

# PART IV

## DISORDERS OF MENSTRUATION

### AMENORRHŒA

Absence of the menstrual function is a natural condition before puberty, after the menopause, during pregnancy, and also, frequently, during lactation. This amenorrhœa of childhood, of age, and of reproduction may be called *physiological* amenorrhœa. Under all other circumstances amenorrhœa is abnormal, and the causes which produce it are various. It is convenient to divide cases of *pathological* amenorrhœa into two classes, viz. Primary and Secondary; the former class consists of cases in which the menstrual function has never been established, the latter includes all cases in which it is suppressed under abnormal conditions. Amenorrhœa is said to be *complete* when several months, or it may be years, elapse without the occurrence of a menstrual period; it is *incomplete* when the intervals are prolonged, it may be to eight to ten weeks, and the amount of the bleeding is scanty.

Amenorrhœa may be brought about by a great variety of different conditions, which can be classified most conveniently as causes of primary and secondary amenorrhœa respectively.

#### *Causes of Primary Amenorrhœa*

1. Anæmia and other general disorders, e.g. advanced tuberculosis.
2. Delayed puberty.

3. Developmental faults:
    - (*a*) Of the uterus—
        - Uterus rudimentarius.
        - Uterus infantilis.
    - (*b*) Of the cervix and vagina—
        - Atresia.
        - Imperforate hymen.
    - (*c*) Of the Ovaries—
        - Imperfect formation or complete absence of ovaries.

*Causes of Secondary Amenorrhœa*

1. General debility from—
    - (*a*) Acute illness ;
    - (*b*) During convalescence from illness or surgical operation ;
    - (*c*) In late stages of chronic disease, e.g. diabetes, chronic nephritis, tuberculosis, malaria, cancer.
2. Severe forms of anæmia.
3. Certain forms of chronic poisoning, e.g. alcohol, lead, morphia ; other varieties of the drug habit.
4. Disorders of the nervous system, e.g. nervous shock, overwork, hysteria, certain forms of insanity.
5. General conditions such as change of climate, imprisonment, etc.
6. Obesity.
7. Local pelvic conditions:
    - (*a*) Obliteration of the uterine cavity from sloughing.
    - (*b*) Atrophy of the uterus, e.g. lactational atrophy.
    - (*c*) Acquired stenosis of the cervix or vagina.
    - (*d*) Bilateral ovarian tumours, especially when solid or malignant.
    - (*e*) Surgical removal of the uterus or of both ovaries.

## Primary Amenorrhœa

When the average age of onset of the menstrual function has been exceeded by two or three years, investigation of the case should be directed first to the condition of the general health, and then to the presence of the general signs of puberty ; if in both of these respects the conditions are normal, the amenorrhœa is probably due to a developmental fault, and local pelvic examination is called for.

It will be recollected in regard to the general health that, in addition to anæmia, other general disorders may prevent the onset of menstruation ; any exhausting disease which seriously lowers the bodily health may have this effect, which is consequently often observed in cases of advanced tuberculosis.

In *delayed puberty* amenorrhœa is associated with non-appearance or imperfect development of the changes which are characteristic of this epoch ; thus the mammae remain rudimentary, the pubic hair and the supra-pubic pad of adipose tissue (mons Veneris) do not appear, the labia majora do not become hirsute, and remain thin and slightly separated in the middle line, allowing the nymphae to project. In these conditions the onset of menstruation may be delayed as late as the twenty-fifth year, and there are many instances recorded in which two or more children have been borne before menstruation has ever appeared. In other instances some serious mental defect is present as well, e.g. the child may be a cretin or a mongolian idiot, but in most forms of idiocy the appearance of menstruation is not delayed.

This form of primary amenorrhœa is scarcely amenable to treatment.

**Developmental causes** form an important and an interesting group of cases. Defects of the *ovaries* are extremely rare ; absence of one ovary does not necessarily affect the process of menstruation at all ; absence of both ovaries is extremely rare except in certain forms of fœtal monstrosity incompatible with extra-uterine existence ; only by careful post-mortem examination can a diagnosis of this defect be established, for the ovaries may be misplaced and so remain unobserved during a clinical examination, or even a surgical exploration of the pelvis. A rudimentary condition of the ovaries in which no Gräafian follicles are present occurs, though rarely ; it may be congenital, or may be the result of disease during infancy, and in either case it is of course incurable.

In the *rudimentary* uterus the organ is represented by a small fibrous body which is usually solid, but may contain a rudimentary cavity. In the *infantile* uterus the organ retains its fœtal characters, viz. relatively small size of the body and large size of the cervix (see fig. 19), but a cavity lined with a mucous membrane is always present. The former leads to incurable amenorrhœa ; in the latter, development sometimes progresses to a certain extent leading to an imperfect menstrual function. Neither condition is amenable to treatment.

*Congenital obstruction* in the genital canal below the level of the uterine body leads to a form of amenorrhœa which is often called *retained menstruation*, since, although the menstrual secretion is normally produced, its exit from the body is prevented. If the obstruction exists at the vulva, in the vaginal canal or in the cervix, menstrual hæmorrhage from the endometrium may occur, which, finding no outlet, becomes pent up either in the uterus, or in the vagina, or at times in both, overflowing in rare instances into the Fallopian tubes and into the pouch of Douglas. The commonest site of the obstruction is the ostium vaginae, the rarest is the cervix.

**Imperforate Hymen.**—Under this designation are probably included two different conditions; both are characterised by the presence of a fleshy diaphragm in the position of the hymen, closing the lower end of the vagina ; in other respects the vagina and vulva are normally developed. Thus the obstructing diaphragm may be formed, either by a septum representing the lower end of the imperforate Müllerian duct, or by non-perforation of the hymen, which then forms a complete transverse septum. In the first-named form of occlusion a distinct hymen may be found lying behind and beneath, i.e. external to, the obstructing membrane ; in the second variety no trace of the hymen can be found apart from the obstructing membrane. The upper part of the genital tract is, as a rule, normally developed in these cases.

The accumulated menstrual blood distends the whole vagina (hæmatocolpos), which may become gradually dilated until it contains from two to three pints of fluid, while the obstructing membrane bulges under the tension of the vaginal contents. A large hæmatocolpos forms a dome-shaped swelling, palpable per abdomen, which may reach as high as the umbilicus, may fill the entire pelvic cavity compressing the rectum, and may even produce a certain amount of dilatation of the anal canal. The uterus, and with it the tubes and ovaries, become elevated, and can

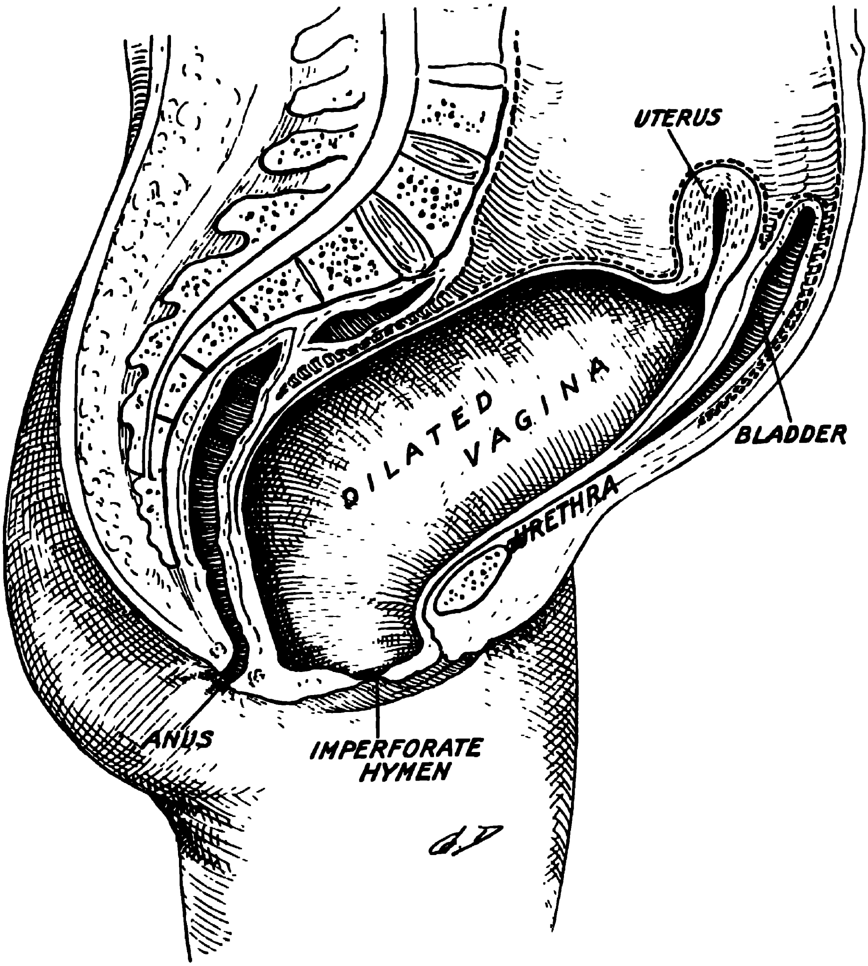

FIG. 62.—HÆMATOCOLPOS (shown diagrammatically), after Cullingworth. The cervical canal is also dilated up to the level of the internal os.

often be felt riding upon the summit of the abdominal swelling (fig. 62). As the anterior vaginal wall stretches, the urethra becomes elongated, while the bladder is carried upwards until it becomes wholly an abdominal organ. The lower part of the cervical canal is not uncommonly found dilated, but accumulation of menstrual blood in the uterus or the Fallopian tubes is only rarely met with. The possibility of this occurrence must, however, be borne in mind, for its clinical importance is considerable.

*Clinical Features.*—The condition here described occurs in girls of about thirteen to eighteen years of age. The rate of accumulation of the fluid varies according to the amount of the menstrual flow. When the retained fluid accumulates slowly, no symptoms beyond the non-appearance of menstruation may be present, and the age of seventeen or eighteen may be attained before attention is directed to the state of affairs. When rapid accumulation occurs, periodic attacks of abdominal pain are generally met with, and such cases come under observation at an earlier age. The attacks of pain appear to correspond with the menstrual epochs, and are no doubt due to fresh hæmorrhage producing a rapid increase in tension in the already distended vagina. They do not, however, necessarily occur every month, but it may be at more or less prolonged and irregular intervals. Coincident rise of temperature is sometimes observed. Gradual enlargement of the abdomen is noticed in the chronic cases, and sometimes, though this is rare, there may be occasional attacks of retention of urine, which are explained by the changes in the bladder and urethra already mentioned.

On abdominal examination a dome-shaped, elastic, fixed swelling may be felt in the hypogastric region, on the convex summit of which is a solid movable body which represents the uterus. The bladder, if distended, covers its anterior aspect; when this organ is empty the swelling is subresonant on percussion, owing to the presence of coils of intestine between it and the abdominal wall. On vaginal examination the labia will be found normal, and on separating the nymphae a dark red membrane will be seen completely closing the ostium vaginae, and bulging slightly between the labia. The perineal body may also bulge, and in cases of extreme distension of the vagina the anus may become slightly relaxed. On rectal examination the finger will detect a tense swelling more or less completely filling the pelvic cavity, and perhaps compressing this part of the bowel.

*Treatment* consists in incising the obstructing membrane under anæsthesia with strict antiseptic precautions, the incision being made with either knife or thermo-cautery. The retained fluid is dark red, or chocolate coloured, and of the consistence of treacle ; it flows slowly away, and owing to its viscidity it is difficult, even with the aid of the douche, to completely remove it. A careful bimanual examination should be made, and the degree of patency of the cervix, the size of the uterus, and the condition of the Fallopian tubes made out. If no accumulation in the uterus or tubes has occurred, the vaginal canal should be cleansed as thoroughly as possible with the douche, normal, sterile saline solution being the most useful in removing the sticky fluid from the vaginal walls. During the next week great care is called for in keeping the vulva surgically clean, and in receiving the discharge into pads of antiseptic wool.

The aperture in the hymen spontaneously tends to close again, and after the first week should be kept open by passing a small tubular speculum, and retaining it in position for a few hours at a time with a pad and bandage, the patient being kept in bed.

If accumulation of the menstrual fluid in the uterus has occurred (hæmatometra), it will flow away spontaneously with the vaginal fluid. Retention in the Fallopian tubes (hæmatosalpinx) is more serious, as spontaneous evacuation does not take place. Prolonged confinement to bed is then necessary in order that absorption of the tubal fluid may occur; but the patency of the oviducts may never be restored. If infection of the vaginal discharge should occur, rapid spread of the infection to the distended tubes, and thence to the pelvic peritoneum, may take place.

*Congenital vaginal atresia* resulting in retention of menstrual fluid is much less common than occlusion at the vulva. Vaginal atresia is more often associated with other defects, incompatible with the establishment of the menstrual function, than is imperforate hymen, and accordingly these cases do not present the same clinical features. Atresia of the lower third of the vagina may, however, result in the formation of a hæmatocolpos, the lower end of which is separated from the vulval *cul-de-sac* by a septum of fibrous

*Treatment.*—Amenorrhœa must, as a rule, be regarded as a symptom, not as a disease; treatment should, therefore, be directed to the underlying morbid condition, the successful management of which has the indirect effect of restoring the menstrual function. The class of drugs known as 'emmenagogues,' to which is attributed a specific influence in exciting menstruation, are disappointing in their effects, and indeed generally prove useless; none of them can with any confidence be recommended, but the following are harmless, and have sometimes, in the opinion of certain observers, proved useful. Apiol (essential oil of parsley) (dose 2–5 minims), either alone or in conjunction with ergot as *ergo-apiol*; manganese in the form of permanganate of potash (dose ½–2 grs.); aloes in mild laxative doses. Ovarian extract may also be given, in the form of tabloids, on the supposition that the amenorrhœa may be due to deficiency of the internal ovarian secretion. The drug which will be found most serviceable is iron, either alone or in combination with arsenic; even when there is no apparent anæmia, this combination will often prove successful after regular use for several weeks. In some cases the use of ferruginous natural waters, such as those of Plombières, Schwalbach and Cauterets, may succeed where direct medicinal treatment has failed. Constipation must in all cases be carefully controlled. In cases where molimina are present, hot hip-baths, taken when these symptoms appear, may be tried. The internal use of electricity is not to be generally recommended; exceptional cases in which it may be employed are cases of lactational atrophy or of mal-development of the uterus.

## DYSMENORRHŒA

This is a subject the discussion of which presents great difficulties, both theoretical and practical. Great diversity of opinion prevails as to the causation of dysmenorrhœa, and there is no unanimity with regard to its clinical varieties, or the methods of treatment which should be applied.

In the first place it must be recognised that dysmenorrhœa cannot be exactly defined; the word signifies painful menstruation, but the great majority of women experience pain, more or less severe, when they menstruate. Pain is in all cases an imponderable symptom, and some women tolerate pain better than others; it is accordingly impossible to define the boundary between what is normal and what constitutes a departure from the normal. Cases are, however, fairly frequent in which menstruation is accompanied by pain so intense as to interfere with the occupation or pursuits of the patient, or even to compel her to stay in bed. Such as these must be accepted as cases of dysmenorrhœa.

There are two factors in the menstrual process which may conceivably become causes of severe pain; one is the *general pelvic congestion*, which, probably, is most intense in the uterus itself; the other is the *contractions* of the *uterine muscle* which dilate the cervix and expel the menstrual fluid. We may accordingly expect to find two varieties of dysmenorrhœa corresponding with these two definite sources of pain; clearly, also, cases may arise in which both factors are concerned, and which will present variations between the two clinical types. Based upon these considerations two clinical varieties of dysmenorrhœa were described by Matthews Duncan, and named by him *Congestive* and *Spasmodic Dysmenorrhœa* respectively.

Other varieties have been described by different writers, either supplementary to these, or in place of them. Thus certain writers classify dysmenorrhœa as *uterine* or *ovarian*. In all probability there is no such thing as 'ovarian dysmenorrhœa'; the idea is based upon the view that ovulation and menstruation are coincident processes, and that the dehiscence of the Gräafian follicles may, under abnormal conditions, become a source of pain. But it is by no means certain that these processes are coincident, or that ovulation *per se* is ever painful. That inflamed ovaries, which are a source of constant pain, will become even more painful during menstruation is obvious, but it is inaccurate to call this pain dysmenorrhœa; it is pain of independent inflammatory origin, aggravated by the menstrual process. It is possible that ovulation in inflamed ovaries, whenever it occurs, may also aggravate the inflammatory pain, but even if this point is assumed it does not follow that menstruation will be painful unless ovulation occurs at the same time.

Many writers have described an *obstructive* form of dysmenorrhœa; this also in all probability does not exist. Flexion of the uterus (see p. 152), a small external os (pin-hole os), or an abnormal constriction at the os internum, have all been cited as conditions which may cause obstructive dysmenorrhœa. No flexion, however acute, can obstruct the uterine canal; owing to the thickness of the walls it is mechanically impossible to kink the uterus, as for instance the bowel may become kinked. Further, narrowness of the os externum or os internum will not prevent the passage of menstrual blood through it in more or less rapid drops, and it must be borne in mind that a certain amount of dilatation of the cervical canal occurs during menstruation, which will facilitate the outflow. Again, the presence of a fibroid polypus in the uterus, which it is said may rest upon the internal os and thus impound the blood, has been cited as a cause of obstructive dysmenorrhœa. This is opposed to clinical facts, for in such cases the menstrual bleeding is usually profuse and free, which would not be the case if the polypus obstructed its exit. Dysmenorrhœa is, however, frequently present in such cases, and is due not to obstruction, but to powerful contractions reflexly excited, which tend to dilate the cervix and to expel the polypus through the cervix into the vagina (p. 231).

Incidentally, obstruction may conceivably occur from the formation of an intra-uterine menstrual clot too large or too firm to pass through the cervix; powerful and very painful uterine contractions may then be excited which further dilate the cervical canal and ultimately expel the clot.

Another variety of dysmenorrhœa frequently described is that of *membranous dysmenorrhœa.* This condition is characterised by the discharge during menstruation of pieces of membrane, usually in strips, more rarely forming a more or less complete cast of the uterine cavity. It is to be regarded not as a disturbance of the menstrual process, but as a disease of the endometrium, and it will be again referred to in connection with the subject of endometritis, as *exfoliative* endometritis (see p. 210). When large pieces of membrane are thrown off during menstruation, great pain is necessarily set up ; but strips and fragments of membrane are frequently passed without giving rise to an abnormal amount of pain. Dysmenorrhœa is therefore not an essential feature of the process, and it is better to consider the condition as independent of the menstrual function.

Only two kinds of dysmenorrhœa can therefore be recognised and described, viz. *spasmodic* and *congestive*; of these it is clear, from what has been said, that the former alone can be regarded simply as a morbid alteration of the menstrual process, and therefore as a disease *sui generis*; the latter is a complex disorder due in the main to conditions which have no direct connection with menstruation, but which influence this function and are in turn influenced by it.

**Spasmodic Dsymenorrhœa.**—The great majority of cases of this disease occur in young women ; sometimes it continues till middle life or the menopause has been reached ; the greater number become cured by child-bearing. It may begin with the first onset of menstruation, but often it does not appear until some years later. Women who suffer from this disease may be otherwise in good health ; more frequently they are either overworked, or of a pronounced neurotic temperament. It has, however, no definite association with disease in any other part of the body.

The menstrual periods are usually regular in rhythm, the flow moderate or scanty, and not unduly prolonged. Occasionally irregularity with long intervals is met with, especially in cases where the uterus is imperfectly developed. The pain begins either some hours before, or at about the same time as, the hæmorrhage. It is in the hypogastric abdominal zone that the pain is chiefly felt, and often it radiates into the back and down the thighs ; there are, of course, many gradations, but it may be of most intense and agonising character, and after some hours may lead to fainting and collapse. It is often attended by severe headache and vomiting. It is usually spasmodic in character, with frequent exacerbations but sometimes it continues without any remission [illegible] several hours.

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In either case the severe pains seldom continue for more than twelve to twenty-four hours, when a spontaneous remission occurs, and during the remainder of the period the pain is comparatively slight. While the severity of the pain is great the hæmorrhage is scanty; along with the remission there usually occurs a freer flow. During the period of severe pain vesical or rectal spasm may occur, leading in some cases to tenesmus of severe and prolonged character. During the first twenty-four to forty-eight hours the patient is often obliged by the severity of her pain, and the exhaustion which follows it, to remain in bed, but the recumbent position does not relieve her; in some cases it appears to aggravate the pain, and accordingly she keeps up as long as she possibly can.

On pelvic examination nothing abnormal can as a rule be found which will account for the pain. Those who regard anteflexion of the uterus as a morbid condition may find it in cases of spasmodic dysmenorrhœa, and may attribute the patient's sufferings to it; this point will be again referred to in another place (see p. 153). In a small number of cases a small ill-developed uterus will be found, and with this may be associated an anteflexion; in such cases it is the imperfect development of the uterus, and consequent inefficiency of its muscle, with perhaps deficiency in the function of 'polarity,' which gives rise to the pain.

The correct view of spasmodic dysmenorrhœa appears to be that it is due to excessive contractions (spasm or tetanus) of the uterine muscle, and is analogous to cramp in voluntary muscles. These contractions are abnormal modifications of those which, occurring naturally during menstruation, have the effect of dilating the cervix, and promoting the outflow of the menstrual blood. In the great majority of cases the reason why these contractions become tetanic is unknown; in some cases the reason may be found in an ill-developed and inefficient condition of the uterine muscle. Herman has suggested that there may be a congenital fault in the functional activity of the uterine centre in the spinal cord or the sympathetic; this view, however, is difficult to reconcile with the fact that the subjects of spasmodic dysmenorrhœa do not display any special inefficiency of the uterus in labour. Women of gouty tendencies ar [illegible] be more liable than others to this disease.

Clinical experience has shown that it is usually associated with a low degree of fertility, or with sterility.

An allied, though distinct, form of dysmenorrhœa occurs in cases where a submucous fibroid becomes converted into a fibroid polypus and is expelled through the cervix into the vagina. Uterine contractions constitute the expelling force, and those associated with menstruation become so exaggerated by the stimulus of the foreign body as to cause, in many cases, extremely severe pains. This is, literally speaking, spasmodic dysmenorrhœa, but in its nature and causation it is clearly to be distinguished from the form now under consideration. The matter will be again referred to in connection with fibroid tumours (p. 231).

*Treatment.*—*Palliative treatment* must be adopted during the attacks. An aperient should be taken daily for two or three days before the period is expected. Although the recumbent position does not always relieve the pain, it is best to put the patient to bed and apply hot fomentations, frequently renewed, to the abdomen. A hot hip-bath at the beginning of the period produces an effect even greater than that of the fomentations. Cases of moderate severity may be sufficiently relieved by administering, in addition, a diaphoretic, sedative mixture containing bromide of ammonia, liq. ammonii acetatis, spiritus etheris nitrosi and camphor water. Or large doses of bromide of ammonia (40–60 grs.), given in a small enema, will often afford relief.

In cases more severe than these, dry-cupping the loins, or the application of a mustard plaster to the dorsal spine, may prove useful. But in addition analgesic or sedative remedies must also be resorted to. One of the most useful is phenazone (antipyrin), which may be given in doses of 10 grains with a little sal-volatile, or 5 ♏ of tincture of capsicum, to counteract the depressing effect of this drug. An agreeable form in which it may be given is the effervescing granules. Other remedies of the same class, such as phenacetin, ammonal, pyramidon and aspirin, may be employed in similar doses. Alcohol, opium and morphia should be withheld if possible, for the alcohol or morphia habit is too readily contracted in such cases. In pain of extreme severity, morphia may be absolutely necessary, and is then best given in the form of a half-grain rectal suppository. General anæsthetics such as chloroform are, of course, unsuitable.

*Curative Treatment.*—Attention to the general health and the administration of tonics are of little use. Certain writers, including Herman, believe that in some cases the disease can be cured by the continuous administration, over a considerable period, of guaiacum, either as Resina Guaiaci in 10-grain doses given in cachets, or as Mistura Guaiaci Co. B.P. This drug is an anti-rheumatic remedy of some repute, and produces no ill effects, therefore a trial may be given to it, although it must be said that failure is much more frequently encountered than success.

The only other possible methods of cure are: (1) the natural cure of child-bearing; (2) the artificial cure of dilatation of the cervix. The latter is undoubtedly of great and sometimes of permanent value; the details of the operation will be described on p. 569. It should be performed a few days before the monthly period is expected, and the beneficial effect will generally last at any rate for several months. In the case of married women it also facilitates the occurrence of pregnancy, and thus may be doubly useful. In the case of sterile or unmarried women the good effect may gradually be lost, and the operation may have to be repeated after an interval.

The rationale of dilatation must be sought in the function of uterine 'polarity.' Regular intermittent uterine contractions act upon the cervix, softening its tissues and dilating its canal, while tetanic contractions have no such effect. Conversely, artificial dilatation of the cervix acts upon the uterine body, producing contractions. These phenomena may be observed both in the gravid and the non-gravid uterus. It appears that forcible dilatation, in cases of spasmodic dysmenorrhœa, exerts a more or less profound influence upon the mechanism of 'polarity,' by which the contractions of menstruation are so regulated that they lose their tetanic or spasmodic character.

Cases of spasmodic dysmenorrhœa are very exceptionally so intractable and so severe that these methods of treatment entirely fail to bring relief, and the patient's life becomes burdensome on account of the severity of her sufferings, and the dread excited by the anticipation of their recurrence. Under these circumstances removal of both ovaries has been practised in order permanently to suppress the menstrual function. If, however, a radical operation is decided upon, removal of the uterus is preferable to removal of the ovaries for the reasons mentioned on p. 268. Such an operation should not be undertaken except in cases of the greatest severity, and after a full trial has been given to all other methods.

**Congestive Dysmenorrhœa.**—While spasmodic dysmenorrhœa is a disease *sui generis*, congestive dysmenorrhœa generally speaking is a symptom of some other morbid condition. It is met with in cases of chronic pelvic inflammation affecting the tubes and ovaries, and the pelvic peritoneum or cellular tissue; in cases of interstitial and submucous fibroid tumours; in some cases of backward displacement of the uterus, especially when complicated by adhesions or by subinvolution. All of these conditions may lead to chronic local congestion, and accordingly may excite more or less constant pelvic pain; when the phase of premenstrual congestion comes round, an exacerbation of pain occurs due to overdistension of the already congested pelvic vessels. The severity of the pain will depend upon (1) the extent of the inflammatory process or, as in the case of fibroids, the degree of interference with the pelvic circulation; (2) the nature and extent of the premenstrual congestion habitual to the individual in question, which is probably a variable factor. After the menstrual flow has been in progress for some time, varying with its amount, relief occurs by depletion of the congested vessels, and diminution of tension. It is probably not in all cases, however, that menstrual congestion reaches its acme before the appearance of bleeding; for in some cases the pain increases in severity during the first day or two, the flow being scanty or moderate, and on the third or fourth day relief occurs accompanied by a more abundant bleeding.

In congestive dysmenorrhœa the pain is never of that acute or agonising character often met with in the spasmodic form. It is continuous and not subject to marked exacerbations; it is usually relieved by rest in bed, the horizontal position being no doubt serviceable in assisting the pelvic circulation. This kind of dysmenorrhœa seldom, if ever, begins with the first onset of menstruation; often a history of some preceding pelvic trouble can be obtained, with which the onset of the dysmenorrhœa is connected. The amount of the bleeding is, as a rule, abundant, or profuse; scanty bleeding is very rare with this variety of dysmenorrhœa; often the period is prolonged, but not necessarily so. The pain is referred chiefly to the back, thighs and both iliac regions. Headache and vomiting are usually absent. On local pelvic examination, some morbid condition, such as those already mentioned, will usually be met with.

*Treatment.*—As this form of dysmenorrhœa is but a symptom of certain forms of pelvic disease, the most important part of the treatment is naturally directed to its cause. *Palliative treatment* during the periods is often necessary. It is always useful, in these cases, to keep the patient in bed until the severity of the pain has abated. Mild purgation each morning for a few days before and during the periods should be employed. Half a pint of warm saline solution injected into the rectum and retained, will often give great relief for a time, and can be repeated. Alcohol and belladonna tend to increase the pain; the coal-tar group of sedatives such as antipyrin are of little use; bromides and opium are the most successful, but should be administered with caution. Drugs such as ergot and hydrastis which check bleeding from the uterus should be avoided, since hæmorrhage is the natural channel of relief. Styptol acts both as a sedative and a uterine hæmostatic, and can be given with good effect in doses of quarter to half a grain. If the period is unduly prolonged, or the bleeding profuse after the pain has abated, ergot in full doses may be employed to arrest it.

**Intermenstrual Pain: Mittelschmerz.**—Although the causal relation of this affection to the menstrual process is not established, it is most convenient to consider it here. It consists of attacks of abdominal pain in the intermenstrual periods which recur at regular intervals; as a rule the attacks occur about midway between two menstrual periods, but in other cases may come on either earlier or later than this. In all cases they preserve a rhythm almost as regular as that of menstruation. The disease affects women during the time of full sexual development, and has not been observed at puberty. Subjects of this affection are nearly always sterile during its continuance, although a considerable proportion have been previously pregnant; in some instances the disease has ensued upon a confinement or a miscarriage. The menstrual function itself is not in all cases abnormal, but a considerable proportion suffer from dysmenorrhœa, and some from menorrhagia. In a few instances a watery or blood-stained discharge is regularly present during the attack of intermenstrual pain. The pain is not acute, seldom indeed severe, but is usually described as aching or bearing-down in character. It bears no comparison with the pain of a severe case of spasmodic dysmenorrhœa.

A local lesion, recognisable by ordinary clinical examination, is present in the majority of cases. The lesion most frequently met with is inflammation, indicated by matting and enlargement of the tubes and ovaries upon one or both sides; in other cases chronic endometritis, a small fibroid tumour, or a backward displacement may be found. It cannot in all cases be assumed that the morbid condition discovered in the pelvis is the cause of the pain.

The *causation* of intermenstrual pain is by no means clear. The theory that it is due to some abnormality of the function of ovulation offers the best explanation of the clinical facts. Thus it accounts for its periodic rhythm, for its varying relation to the menstrual period, and for the frequency with which it is associated with inflammatory lesions of the tubes and ovaries. It is possible that in inflamed or adherent ovaries the process of dehiscence of the Gräafian follicle is interfered with, and rendered more difficult, and consequently painful. This may clearly be induced by general thickening of the tunica albuginea, or by previously existing adhesions of that part of the ovarian surface upon which the ripening follicle presents. The view advanced by certain writers that it is due to intermittent hydrosalpinx (see p. 415), while it may account for the occasional accompaniment of a watery discharge, does not explain the principal feature of the affection, i.e. its regular periodicity.

The *treatment* consists essentially in the treatment of the local lesion which may be present. The attacks of pain may be relieved by the same remedies as those employed in cases of dysmenorrhœa. The prospect of permanent cure is not hopeful.

# PART V

## MORBID CONDITIONS OF THE UTERUS

| | |
|---|---|
| DISPLACEMENTS | NEW GROWTHS |
| ENDOMETRITIS | HÆMATOMETRA |
| CHRONIC METRITIS | PYOMETRA |

## DISPLACEMENTS OF THE UTERUS

**Normal Supports of the Uterus.**—It is necessary in the first place to consider the mechanism by which the uterus is maintained in its normal position. The description which has been given of the uterine attachments shows that these are for the most part of a loose and yielding character, and do not greatly limit the mobility of the organ in any direction.

The position of *anteversion* with slight anterior flexion, is the natural position of the uterus from later fœtal life onwards; intra-abdominal pressure and the force of gravity help to maintain it in the adult. The round ligaments vary greatly in thickness and are quite incapable of offering any appreciable resistance to forces tending to displace the body of the uterus backwards. The utero-sacral ligaments offer a certain resistance to that forward movement of the cervix which usually accompanies backward displacement of the body, but not enough to prevent it.

The mechanism by which the *horizontal level* of the uterus is maintained is a problem which offers considerable difficulties. It is certain, from their characters, that most of the so-called 'ligaments' are incapable of adequately supporting the uterus, or of resisting forces which tend to cause its descent or prolapse.

The firmest and strongest of the uterine attachments appear to be the bands of fibrous tissue already described as the *transverse ligaments of the cervix* (p. 25); in the same category may be placed the strong fibrous sheaths of the uterine arteries which reach the cervix at about the same level. It has frequently been pointed out that in the operation of removing the uterus *per vaginam*, the cervix cannot be pulled down much below its normal level until these structures have been divided, when it can easily be drawn outside the vulva. It appears, therefore, that the strongest uterine supports are those in the neighbourhood of the corporeo-cervical junction.

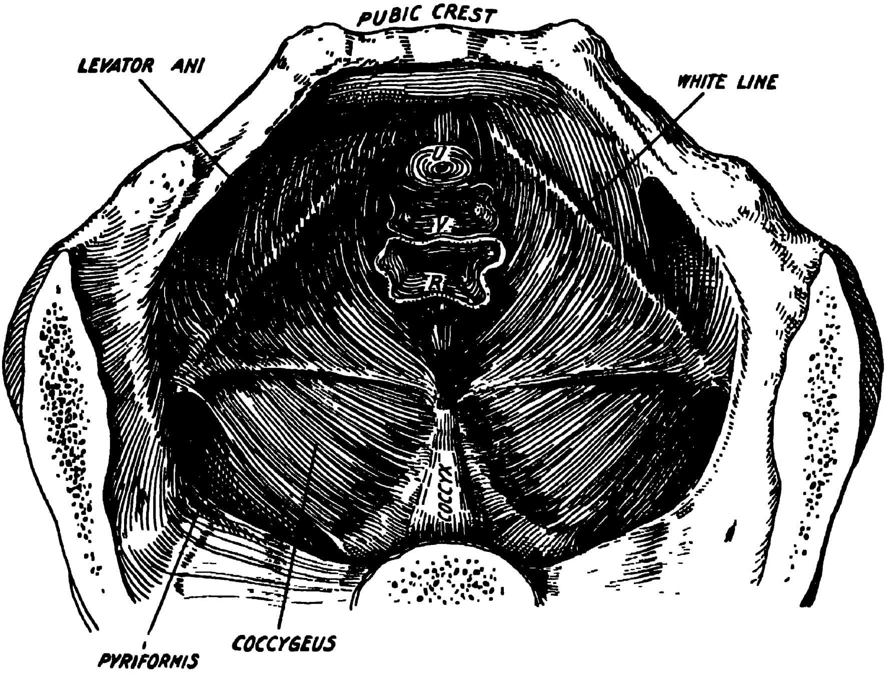

FIG. 63.—THE PELVIC DIAPHRAGM AS SEEN FROM ABOVE (Deaver).

From below, the uterus is supported by the mass of soft tissues which fill in the pelvic outlet. These tissues may be divided for descriptive purposes into two layers, a deep layer forming the *pelvic diaphragm*, and a superficial (inferior) layer corresponding to the anatomical perineum, the *pelvic floor*.

*The Pelvic Diaphragm.*—This structure limits the general abdomino-pelvic cavity below, as the diaphragm limits it above, and both are musculo-fascial structures. As the diaphragm is pierced by the aorta, superior vena cava and œsophagus, so the pelvic diaphragm is pierced by the urethral, vaginal and rectal canals. It forms a somewhat funnel-shaped structure, the sides of which slope from the pelvic walls downwards and towards the middle line ; in the funnel or basin thus formed the pelvic viscera rest (fig. 63).

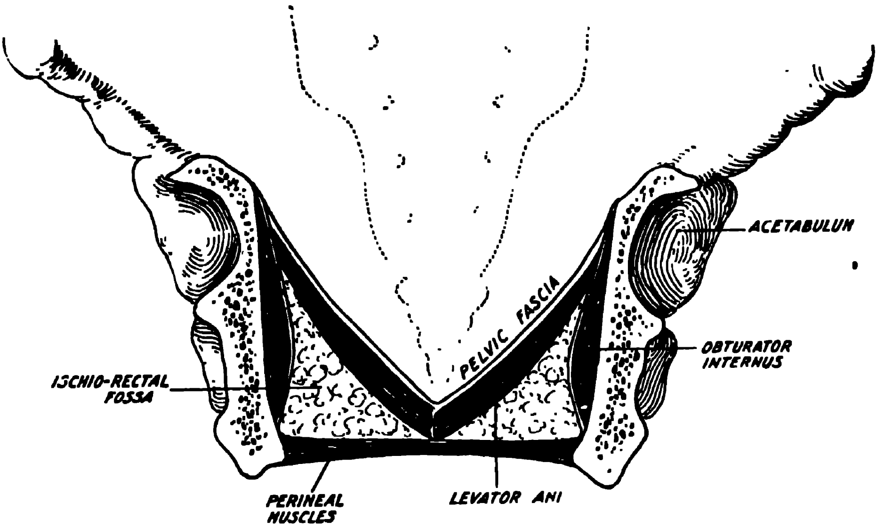

FIG. 64.—THE PELVIC DIAPHRAGM IN CORONAL SECTION (diagrammatic).

The pelvic diaphragm is composed of two layers : a deep (superior) fascial layer, and a superficial (inferior) muscular layer. The former is a part of the visceral layer of the pelvic fascia which arises from the white line, and serves to form part of the inner wall of the ischio-rectal fossa. The latter is formed by the levator ani and coccygeus muscles. The general arrangement of the muscles is seen in fig. 64. The levator ani has a long continuous line of attachment to the pelvic wall from the back of the symphysis pubis in front, to the ischial spine behind. Its fibres pass more or less obliquely downwards and inwards to meet those of the opposite side, or to become attached to the walls of the urethra and vagina, to the median aponeurosis between the vagina and the anus, and to the coccyx. Muscle and fascia are closely blended, the latter being in fact the muscular aponeurosis. The lower surface of the levator ani is covered by the thin anal fascia. The levator ani is a comparatively feeble muscle and the fascial layer is thin ; further, the canals which traverse the pelvic diaphragm greatly weaken it as a base of support. The tissues of the pelvic diaphragm are closely united to the wall of the urethra in its lower half, to the cervix, to the vaginal vault, and posteriorly to the coccyx. The rectum lies in a distinct and separate lacuna which allows it a free mobility.

It will thus be seen that the pelvic diaphragm forms the sloping floor upon which the pelvic viscera rest. The anterior edge of the levator ani can usually be palpated clinically by passing one finger into the vagina and placing the thumb upon the skin surface in front of the ischial tuberosity; if the patient is now asked to cough, the edge of the muscle will be thrown up in contraction and readily felt. When it has been considerably stretched or injured in parturition, the edge is hardly to be felt even during contraction.

*The pelvic floor* (anatomical perineum) contains certain subcutaneous muscles (see p. 57) which fulfil the function of sphincters, and are altogether too feeble to resist the downward pressure of the pelvic viscera. The canals which pierce it weaken it still further. The central and strongest portion, the *perineal body*, is frequently destroyed by obstetric injury, and experience shows that in such cases the uterus may still retain its normal level. The pelvic floor, therefore, is not an essential support of the uterus.

The pelvic diaphragm is undoubtedly of more importance than the pelvic floor. It is also not infrequently lacerated in its anterior portion during labour, and it is generally believed that such an injury as this may occur without necessarily leading to prolapse of the uterus, but this point has not been verified by actual dissection. It is doubtful whether structures so feeble as the levator ani and coccygei, with their aponeurotic covering of pelvic fascia, could alone maintain the horizontal position of the uterus, but they are probably an important auxiliary. These muscles are morphologically the homologues of the strong tail-wagging muscles of the lower vertebrate animals. In man they are relatively ill-developed, and, as Paramore has shown, they have assumed a different function, viz. that of enabling the pelvic floor to meet variations in intra-abdominal pressure. These muscles are thrown into contraction, not only during the act of defæcation, but also whenever a sudden increase in intra-abdominal pressure occurs, as in the acts of coughing and sneezing, or during violent muscular exertion. Thus they support the pelvic viscera against forces tending to drive them through the pelvic outlet.

Matthews Duncan laid great stress upon a certain *negative* pressure which he believed to exist in the peritoneal cavity, and which he pictured as holding the uterus up in its place. Recent observations have, however, shown that there is considerable *positive* pressure in certain hollow viscera, such as the rectum and the stomach, and it is open to grave doubt whether negative pressure, even if it exists at all in the peritoneal cavity, has sufficient force to affect the position of any of the organs contained in it. The acts of coughing and sneezing, and severe muscular effort, produce a high positive pressure within the abdomen, and these become, when frequently repeated, predisposing causes of uterine prolapse.

The matter may be summed up by saying that the uterus is maintained at its normal level, when at rest, by the transverse bands attached to the upper part of the cervix and by the pelvic diaphragm; during intermittent rises of intra-abdominal pressure these are supplemented by the functional activity of the levator ani and coccygeus muscles. Alterations in the uterine level may result from injury to, or possibly from congenital weakness of, these supporting structures; a temporary or permanent rise of intra-abdominal pressure, as from chronic coughing, or from the formation of an abdominal tumour, may also cause descent of the uterus; and in some cases more than one of these causal conditions may be present.

The term *displacement* of the uterus is understood to include some departure from the normal *position* of the organ, and also in most cases an alteration in its *axis*.

The simplest form of displacement is that in which an alteration of position occurs without marked alteration in the uterine axis. Thus the uterus may be pushed bodily forwards against the pubes (*ante-position*) by some tumour or collection of encysted fluid in the pouch of Douglas; a little straightening of the uterine axis may result, but the organ remains anteverted. Similarly the uterus may be pushed back into the sacral hollow (*retro-position*) by a tumour in the utero-vesical pouch, or drawn there by contraction of old inflammatory adhesions in the pouch of Douglas. Or it may be pushed over to one side of the pelvis by a laterally situated swelling, e.g. a cyst developing between the layers of the broad ligament on the opposite side (*sinistro-* or *dextro position*), or drawn over by contraction of the cellular tissue upon the same side. Again, the uterus may be raised above the level of the pelvic brim (*elevation*) by a collection of retained menstrual fluid in the vagina (p. 131), or it may become twisted in its long axis (*rotation*) as in some cases of fibroid tumours (p. 256).

It will be obvious that such displacements as these, though of anatomical interest, are of little practical importance; they are mechanical results of other morbid conditions which are of far greater importance, and are only capable of correction by removal of these conditions. Downward displacement is of great practical importance and will be separately considered as *uterine prolapse*.

Displacements are usually accompanied by an alteration in the direction of the uterine axis, which may be of two kinds—*version* or *flexion*. Instead of the body of the uterus being directed forwards towards the pubes, it may be directed backwards towards the sacral hollow (*retroversion*), or more rarely towards one or other side of the pelvis (*lateriversion*). In such cases (*versions*) the width of the angle between the body and the cervix is not much altered. But in other cases the width of this angle is diminished until it becomes acute, when the uterus is said to be *flexed*; if the uterine body remains directed forwards the condition is called *anteflexion*; if occurring in connection with dsplaicement backwards, *retroflexion*. For practical purposes no distinction need be made between versions and flexions, and they will be considered together in the succeeding paragraphs.

**Hernia of the uterus** (hysterocele) is the rarest of all uterine displacements, and requires only brief mention. Four varieties occur, viz. inguinal, femoral, obturator, and umbilical or ventral uterine hernia. All except the first-named are extremely rare. A gravid uterus may become *herniated through the linea alba or the linea semilunaris from the yielding of a cicatrix in those positions.*

*Inguinal hernia may be congenital, and in such cases the* uterus is frequently found to be rudimentary; it may be bicornute, and in such cases a double uterine hernia may occur (p. 523). In other respects the subjects of this condition are usually well developed, but a number of cases have been recorded in true or pseudohæmaphroditism (p. 530) and in connection with hypospadias. Inguinal uterine hernia is, however, sometimes *acquired*, the subjects being women who have borne many children. First the broad ligament with its tube and ovary become drawn into the hernial sac, and finally the uterus follows it. A few instances have occurred in which the uterus was found to be gravid. A uterine hernia may become strangulated, but the symptoms are only subacute. A radical operation is always required for the relief of this form of hernia.

## FORWARD DISPLACEMENT

Anteversion is the normal position of the uterus; it varies continually with the filling and emptying of the bladder, and is usually exaggerated in early pregnancy. While the width of the corporeo-cervical angle remains normal, the condition is not to be regarded as pathological.

*Anteflexion* occurs under two different conditions; in some cases it is congenital, and is associated with deficiency in size and development of the whole organ; in other cases, which, however, are very rare, the displacement is acquired, being brought about by contraction of the utero-sacral ligaments (chronic utero-sacral cellulitis) pulling the cervix upwards and backwards, and thus increasing the acuteness of the uterine angle. The same result may ensue from adhesions in the lower part of the pouch of Douglas pulling back the cervix and posterior vaginal wall. The uterine angle may then be reduced below a right angle, with a consequent abrupt alteration in the direction of the uterine cavity (fig. 65). Both the congenital and the acquired types are rare, the latter being especially uncommon.

It will often be noticed that in anteflexion the cervix is also bent forwards, so that the external os is directed anteriorly, instead of downwards and slightly backwards.

*Diagnosis* is easy by bimanual examination, and the passage of the sound. In the congenital type the uterus is freely movable, while in the acquired type its mobility is necessarily limited by the adhesions, or by the contracted posterior ligaments. The degree of flexion can be estimated by the index finger placed in the anterior fornix. It must be borne in mind that the uterine angle is subject to considerable variation in size under normal conditions, and slight degrees of anteflexion, therefore, sometimes occur in health. Certainly not all cases are pathological; only those should be so regarded in which either deficiency in size of the uterus, or chronic inflammatory changes are found in connection with it. Under all other conditions anteflexion is not pathological and does not require treatment.

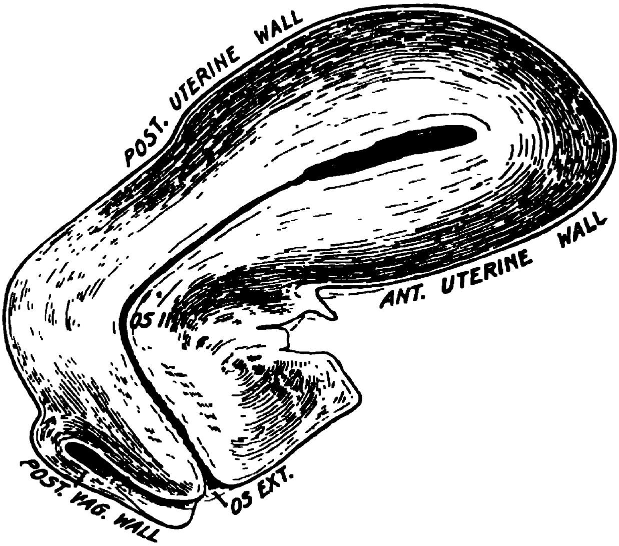

FIG. 65.—ANTEFLEXION OF THE UTERUS (Charing Cross Hospital Museum). From a nullipara.

The two main *symptoms* of pathological anteflexion are dysmenorrhœa and sterility. The bend in the uterus is not, however, directly responsible for either of these symptoms; in the congenital type both are due to the deficient development of the organ; in the chronic inflammatory type they are due mainly to the associated inflammatory lesions (see p. 425).

It follows from what has previously been said that the *treatment* of these cases is to be directed not to the correction of the abnormal uterine angle, but to the alleviation of the causal conditions when practicable. In the congenital type dilatation of the cervix may be performed, but it is of only temporary benefit; in a few fortunate cases pregnancy may follow this operation and a permanent cure may then result. Attempts to stimulate the development of the uterus by the electric current have been made, and have generally proved unsuccessful. In the chronic inflammatory type the treatment is that of chronic pelvic inflammation.

## BACKWARD DISPLACEMENT

Although anteversion is the usual position of the uterus, not all cases in which it is directed backwards can be clinically regarded as pathological. This statement is justified by the observation that in a considerable number of cases the 'displacement' does not give rise to any ill effects. In some cases this position may be congenital, for retroflexion has been observed in the new-born infant; in others the displacement is certainly fortuitous, for on a second examination, after an interval, the uterus may be found to have risen spontaneously into its normal position. In nulliparous women, especially when unmarried, great caution is called for, as in a considerable proportion of such cases the backward displacement causes no symptoms and requires no treatment. When, in young women suffering from some manifestation of hysteria, the uterus is found to be directed backwards, the hasty conclusion that this is the cause of the hysteria must be resisted, for in such patients treatment of the displacement often aggravates their ill-health.

No distinction need be made between retroversion and retroflexion (fig. 66); the causes, symptoms and treatment of the two are practically the same; but cases in which the uterine angle is acute are usually more severe than the others. In retroversion the uterine axis, as a rule, is nearly straight, the cervix is pushed forwards nearer than usual to the symphysis, and the os is directed anteriorly. In both retroversion and retroflexion the fundus commonly lies at a lower level than the os externum; this probably causes a mechanical difficulty in the expulsion of menstrual fluid or of secretions from the body of the uterus. Slight degrees of prolapse are frequently associated with backward displacement.

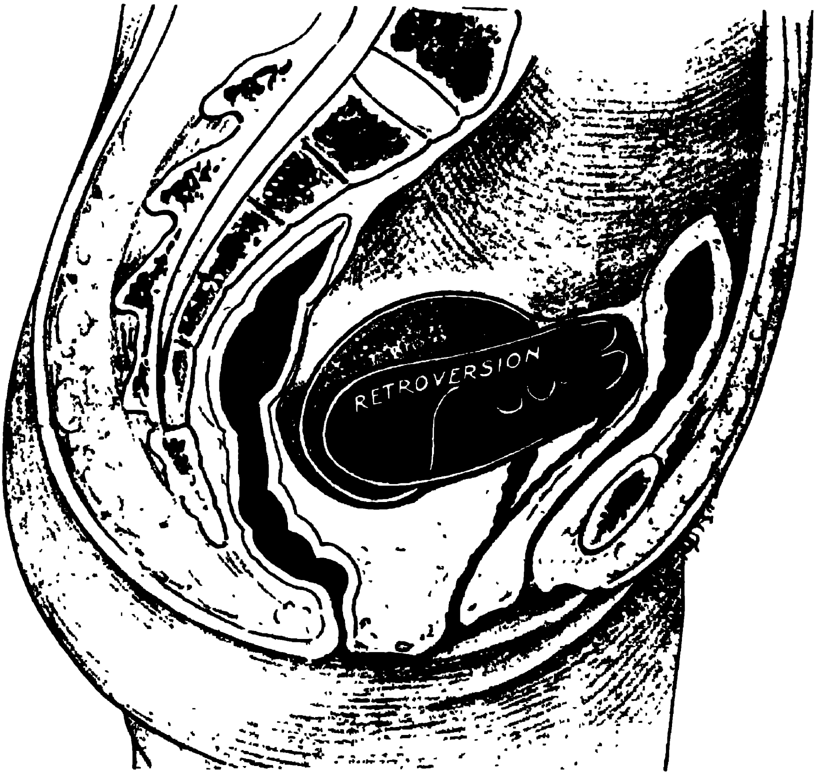

FIG. 66.—THE VARIETIES OF BACKWARD DISPLACEMENT OF THE UTERUS (diagrammatic).

The commonest cause of backward displacement is a general lax condition of the uterine supports, due in many cases to child-bearing, but also occurring not infrequently in nulliparous women. Possibly, relaxation of the utero-sacral ligaments plays the most important part, for resistance to undue forward movement of the cervix is an important element in preserving the anterior inclination of the body. In these circumstances the uterus may be readily displaced backwards by overdistension of the bladder, or by a fall. Such a result is obviously more likely to occur if the uterus is unusually heavy, as from early pregnancy, or subinvolution, or from enlargement due to a small fibroid tumour. Backward displacement is also an incidental result of prolapse of the uterus, and sometimes occurs in consequence of a great increase in intra-abdominal pressure from the presence of a large tumour, or the collection of a large amount of fluid in the peritoneal cavity. Contraction of the cellular tissue between the cervix and the pubes from old-standing cellulitis, may also cause backward displacement by pulling the cervix forward; this condition is, however, extremely rare. A retroverted uterus is frequently found to be adherent to the pouch of Douglas, and in such cases the displacement may have been produced by the inflammatory process which caused the adhesions. Not infrequently, however, such adhesions are a sequence of the displacement, not the cause of it.

When the uterus has for some time been lying in a backward position, two important changes are frequently met with which result directly from its abnormal inclination; these are enlargement of the uterine body, and prolapse of the ovaries. Enlargement of the uterine body probably results from circulatory disturbance. Except in congenital cases, the venous return from a retroverted uterus is somewhat obstructed by folding of the broad ligaments over the lateral borders of the pouch of Douglas, viz. the utero-sacral ligaments. The better these structures are developed the greater the pressure they will then exert upon the veins of the broad ligament. Congestion ensues, leading to chronic endometritis, and its common accompaniment 'erosion' of the cervix (see p. 195). The ovaries cannot retain their normal level when the uterine body lies in the pouch of Douglas; at first they lie in the lateral rectal pouches (see fig. 4), but sooner or later they descend to the floor of the pouch of Douglas, where they lie underneath, or at the sides of, the uterus.

Other changes not infrequently found in cases of backward displacement are adhesions uniting the uterus to the floor of the pouch of Douglas, a condition usually accompanied *by chronic inflammation of the tubes and ovaries. They seriously aggravate the symptoms from which the patient suffers, and by preventing non-operative reduction of the displacement, they render the treatment more difficult. In* some cases, backward displacement, by interfering with drainage of the uterine cavity, becomes a contributory cause of *pyometra* (p. 320).

*Symptoms.*—It has been mentioned already that in a certain proportion of cases, backward displacement gives rise to no symptoms and requires no treatment. In the majority, however, the following symptoms, or some of them, will be met with: *pain* in the lower abdomen and sacral region; *menorrhagia, dysmenorrhœa* and *leucorrhœa*; and married women may complain, in addition, of *dyspareunia,* and *sterility.*

Pain is never acute, but is more or less constant and of a dull aching, or dragging, character; it most commonly takes the form of backache, or sometimes of a dragging pain in one or other iliac region. Pain is usually most severe in cases where the uterus is adherent, or the ovaries are prolapsed. Menorrhagia and leucorrhœa are the result of the accompanying endometritis. Dysmenorrhœa may be due in part to congestion, in part to the increased difficulty which the uterus meets with in expelling the menstrual blood, when the uterine body lies below the level of the internal os, as in cases of marked backward displacement (fig. 66). Dyspareunia is seldom present, except in cases where recent adhesions exist, or where the ovary is completely prolapsed, i.e. lies on the floor of the pouch of Douglas. Women with a backward displacement are by no means necessarily sterile; but it has been frequently observed that after several years of non-fertile marriage, cure of a backward displacement has been followed by conception. This displacement is therefore a factor in the causation of sterility; probably the upward and forward displacement of the external os makes the entrance of spermatozoa into the uterus somewhat more difficult than under normal conditions. The association of various nervous symptoms, and sometimes of severe neurasthenia, with uterine displacement has already been referred to. In some cases these conditions are consecutive to, and result from, the uterine trouble; in the majority, however, this is *not so.*

*The diagnosis of backward displacement can be made only by internal examination. Per vaginam the examining* finger first notes the forward displacement of the cervix; this is most marked in cases of retroversion (fig. 66). Owing to the frequency with which slighter degrees of prolapse are associated with backward displacement, the uterus is often found at a lower level in the vagina than normal. The anterior fornix is found empty on bimanual examination, i.e. the uterine body cannot be felt there. Exploring the posterior fornix, a body will be felt there which in favourable cases can be at once shown to be the uterus. The following three points suffice for this diagnosis: (*a*) the structure found in the pouch of Douglas can be felt to be continuous with the cervix, no sulcus or interval being recognisable between them; (*b*) on moving the cervix from side to side with the finger, the body in the pouch of Douglas will be felt to move with it; (*c*) the characteristic, pyriform shape of the uterine body may be recognised, the broad end being in this case the lower one. The latter point can often be more readily made out by rectal than by vaginal examination. It is often difficult to make a bimanual examination of a retroverted uterus except under anæsthesia. The lateral fornices should be next explored, and if one or both ovaries are prolapsed they will be felt and recognised by their oval shape and ready mobility. Confirmation of diagnosis may be made in a difficult case by the passage of the sound. Finally, an attempt should be made to push the body of the uterus upwards and forwards in the axis of the pelvic brim, when an estimate of its degree of freedom from adhesions may be formed. Adhesions often permit a considerable degree of mobility, but when stretched they usually cause pain, and can sometimes be felt by the finger as tense bands.

Difficulty will in some cases be met with from extreme tenderness of the uterus, in others from loading of the rectum with scybala. Detailed diagnosis must then be deferred until the appropriate preparatory treatment has been carried out.

*Treatment.*—A preliminary question of some difficulty may arise, viz. Does the displacement require treatment?

Although absolute rules cannot be laid down, the following general principles should be followed: (1) in young unmarried women local treatment should be avoided except *when the symptoms mentioned above are well marked and cannot be relieved by other means; (2) in sterile women the uterus should be replaced even if no pelvic*

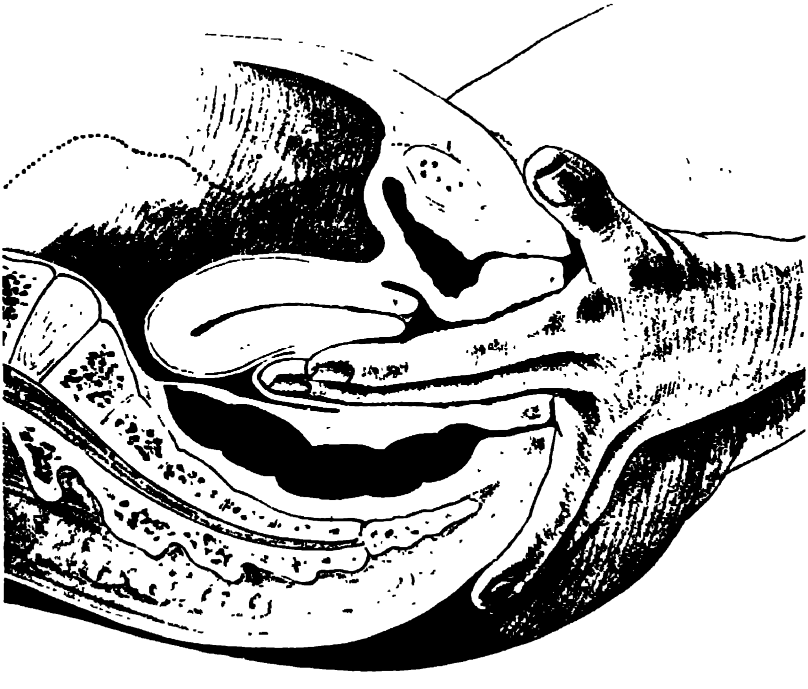

FIG. 67.—METHOD OF DIGITAL REPLACEMENT OF A RETROVERTED UTERUS; first step, in which the body is pushed up to the level of the sacral promontory.

symptoms are present; (3) cases in which the uterus is also prolapsed or adherent, or in which the ovaries are prolapsed, require treatment in almost all cases.

The object of treatment is to reduce the displacement and to maintain the uterus in its proper position; failing this, some relief of symptoms may be obtained by palliative measures. In recent cases, especially those occurring after child-birth and associated with subinvolution, and whenever the symptoms are not severe, a course of massage and passive exercises, combined with a period of rest in bed, may not only relieve the symptoms but restore the uterus to its normal position. Usually, however, mechanical reposition is required.

Before attempting to replace the uterus preparatory treatment is sometimes necessary. It is essential that the lower bowel should be empty, and in patients habitually constipated a course of aperients may be necessary; if the displaced uterus is very tender replacement without an anæsthetic cannot be carried out, owing to the pain which the manipulation causes. The patient may then be sent to bed for a week, and treated with hot vaginal douches twice or three times a day, vaginal pessaries or

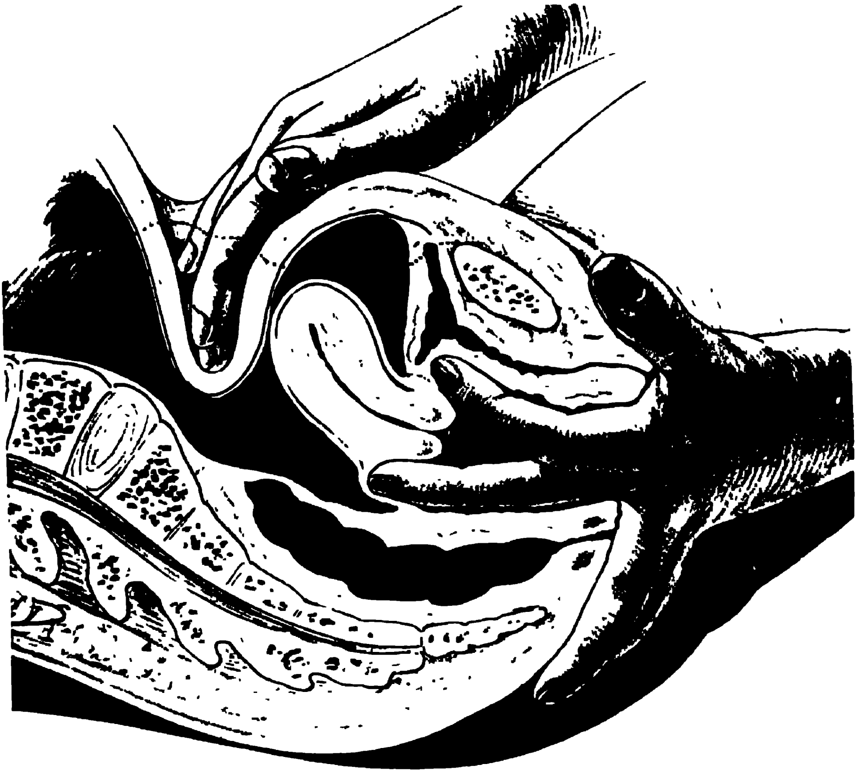

FIG. 68.—METHOD OF DIGITAL REPLACEMENT OF A RETROVERTED UTERUS; second step, in which the fundus is drawn forwards away from the sacrum, and the cervix pushed upwards and backwards.

tampons of glycerine or glycerine and ichthyol (see p. 617), a daily saline aperient before breakfast, and a light diet without alcohol. The employment of general anæsthesia, although it allows of the uterus being replaced, does not obviate the necessity for these preparatory measures, for a pessary cannot be supported in comfort by the patient when great tenderness of the pelvic organs is present.

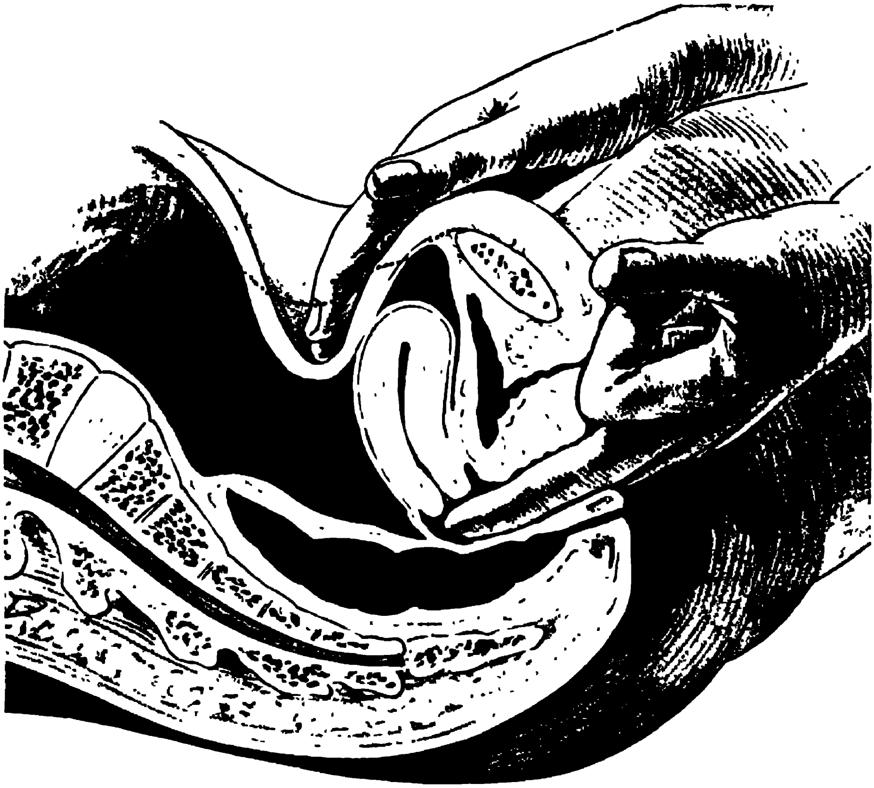

FIG. 69.—METHOD OF DIGITAL REPLACEMENT OF A RETROVERTED UTERUS; third step, in which the fundus is drawn forwards to the pubes, and the whole uterus elevated.

The displaced uterus may be reduced with the fingers, either alone or aided by the uterine sound; if anæsthesia is not employed the Sims's position is the most useful (fig. 58). The index and middle fingers of one hand are first passed into the posterior vaginal fornix, and with them pressure is made upon the fundus of the uterus in an upward and forward direction towards the pelvic brim (fig. 67). With the assistance which the Sims's position lends to this manœuvre, the fundus can easily be raised to the level of the sacral promontory ; but the most difficult part of the reduction remains. If the abdominal walls are thin and lax, they can now be depressed by the fingers of the other hand until these pass behind the uterine fundus, which is

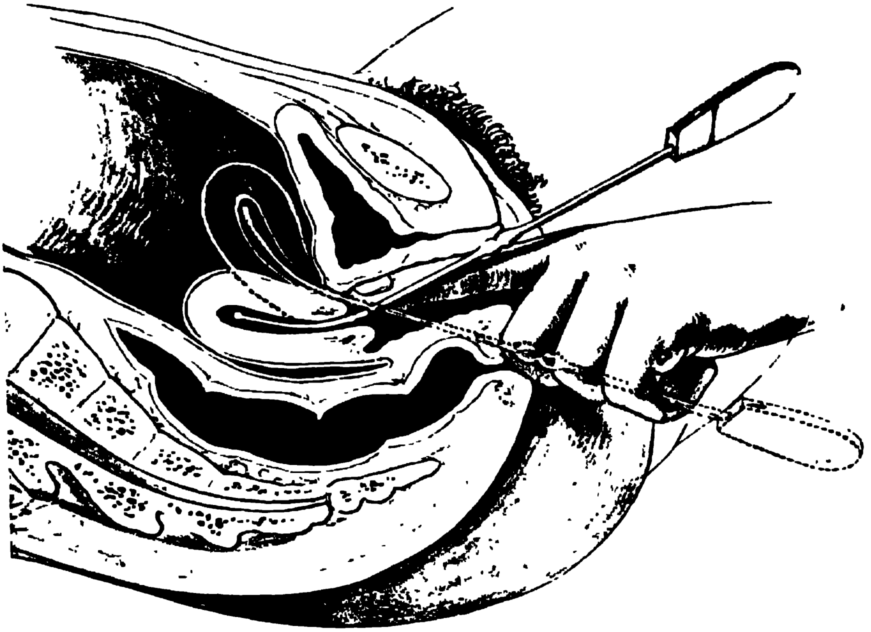

FIG. 70.—USE OF THE SOUND IN COMPLETING THE REPLACEMENT OF A RETROVERTED UTERUS.

then gently directed forwards towards the symphysis, while the internal fingers push the cervix upwards and backwards towards the sacral hollow, as shown in figs. 68 and 69.

The second and third stages can often be best carried out after getting the patient to turn over on her back, while the operator keeps the uterus in the position to which he has raised it. With the complete muscular relaxation of general anæsthesia, the aid of Sims's position is not required, and the whole procedure can be carried out with the patient on her back. The index finger in the rectum is of great assistance when difficulty in raising the fundus is met with.

In stout or nervous women, and sometimes in others, the supplementary aid of the sound will be required. The fundus should first be raised as much as possible with the fingers, in the manner just described; then the sterilised sound is introduced through the cervix by the direct method, and passed into the uterine cavity as in fig. 70; the uterus is then pushed forwards by carrying the handle well back upon the perineum, when the fundus will necessarily be directed against the pubes. If the fundus of the uterus cannot be satisfactorily anteverted, adhesions are probably present; in some cases, as soon as the retaining finger or sound is removed, the uterus immediately falls back into its faulty position, when the same explanation may apply.

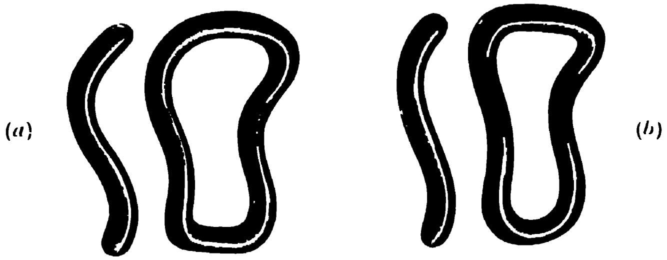

FIG. 71.—PESSARIES FOR BACKWARD DISPLACEMENT. (*a*) Hodge Pessary; (*b*) Albert Smith Pessary. Note that the lower end of (*a*) is square, and its profile curve is more pronounced than (*b*).

When the uterus has been satisfactorily reduced, a suitable pessary should at once be introduced to retain it in position. The most convenient pessary for general use in these cases is the Hodge or Albert Smith pattern, shown in fig. 71, or one of the various modifications of these patterns. The surgically clean instrument is held in the fingers of the right hand as in figs. 72 and 73, and introduced in the antero-posterior diameter of the vulva, the perineum being held back by the index finger of the left hand. If the uterus has been replaced with the sound, the pessary may be introduced by passing it over the handle of the sound, the latter keeping the uterus in position. It is then pushed on gently in an upward and backward direction, until about one-half of the instrument is within the vagina. The right index is then directed along the posterior vaginal wall to the upper bar of the pessary, which can then be carried on until it lies behind the cervix in the posterior fornix (fig. 74); the pessary will of itself rotate into the transverse diameter of the vagina as this is being done. The lower end of the instrument should now lie just within the ostium vaginae *and in contact with the anterior vaginal wall, well above the urinary meatus; it thus rests against, and is supported by, the thick soft tissues which lie behind the lower end of* the symphysis pubis, and which serve as its *point d'appui* The upper end carries the posterior fornix upwards and backwards, and thus prevents forward displacement of the cervix. If, however, the vaginal walls and uterine supports are very lax, or if the pessary is too short, it is quite possible for the body of the uterus to fall back over the top of the instrument into the pouch of Douglas.

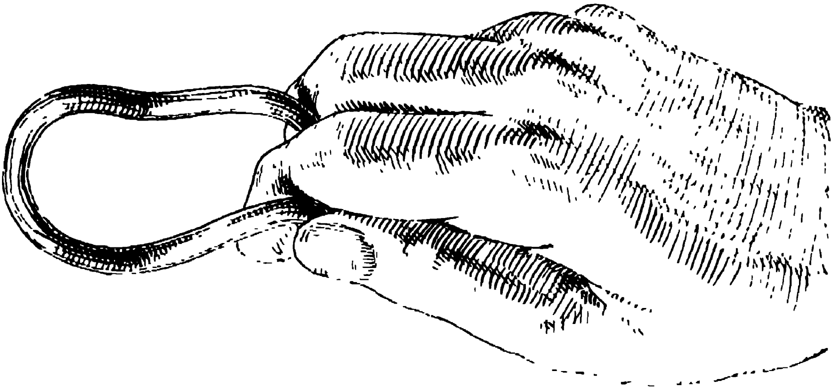

Fig. 72 How to hold the Hodge Pessary

These pessaries are made of vulcanite or metal, rigidity being an important element in their construction. The instrument should be carefully adjusted to the length and capacity of the canal in which it is to lie. It should cause no discomfort to the patient, who should indeed be unconscious of its presence after introduction. If none of the commercial sizes is perfectly satisfactory, vulcanite instruments can be moulded to the required shape, after immersion in boiling water. If the pessary does not retain the uterus in its corrected position, it cannot be regarded as satisfactory, although some relief of symptoms may nevertheless be obtained.

The use of pessaries for backward displacement should be regarded as a temporary expedient only. In a certain proportion of cases, after an instrument has been worn for from three to twelve months, the uterus will be found to remain anteverted without it, i.e. the pessary has cured the displacement. If the condition cannot be cured by this method, operative treatment should be recommended.

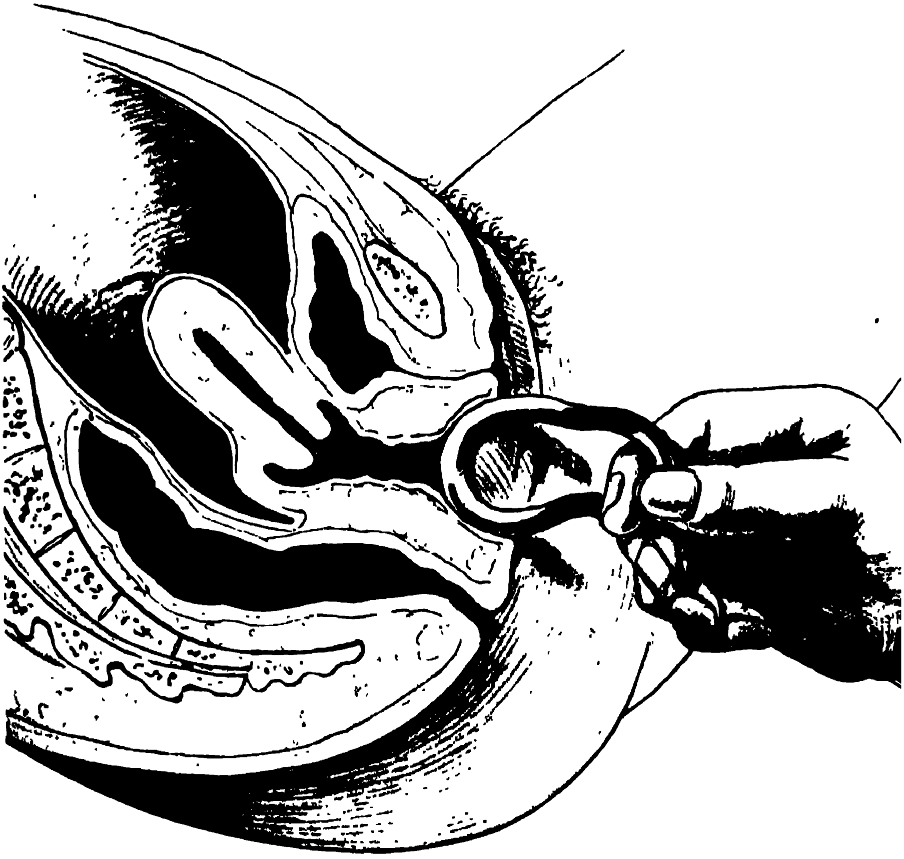

FIG. 73.—HOW TO INTRODUCE THE HODGE PESSARY; first step, the instrument passing through the ostium vaginae.

The patient should be directed to use a vaginal douche daily for purposes of cleanliness, while wearing the pessary, which should also be removed every three months, thoroughly cleaned and then re-introduced, or a new one supplied. Neglect of these precautions may lead to vaginal infection, and, especially in the case of ill-fitting instruments, to extensive ulceration of the vaginal walls. The instrument does not interfere with marital intercourse.

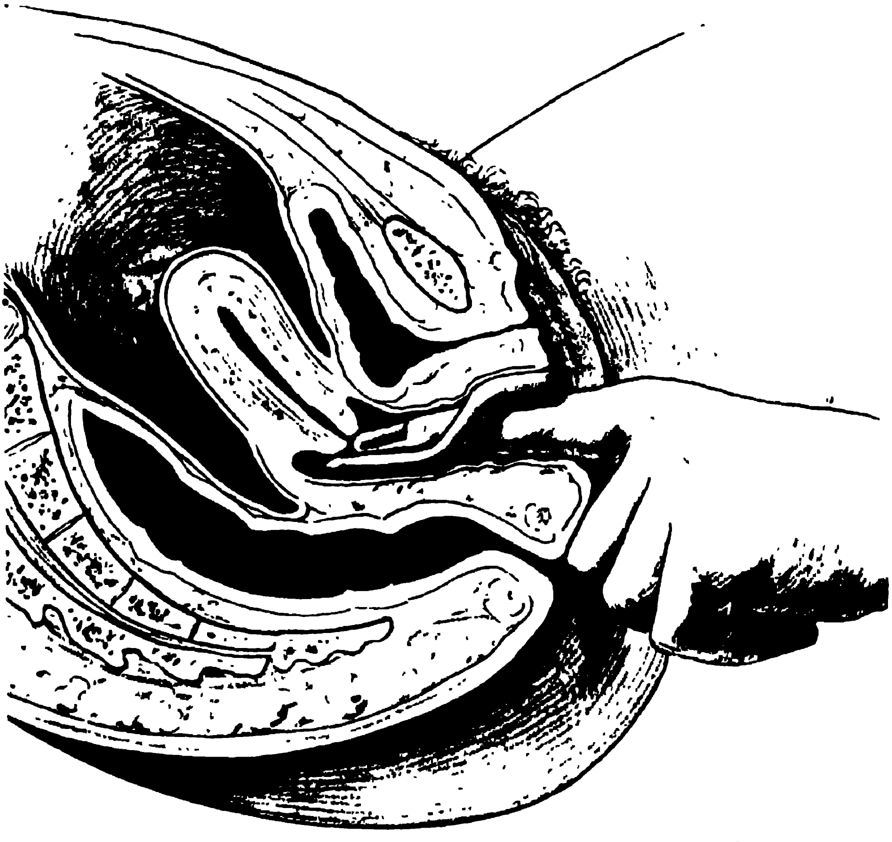

FIG. 74.—HOW TO INTRODUCE THE HODGE PESSARY; second step, the instrument being pushed up into the posterior fornix.

All cases in which the uterus can easily be anteverted, provided that they require treatment at all, are suitable for the method just described. If the ovaries are prolapsed they will ascend out of the pouch of Douglas as the uterus is carried forwards, and will remain there as long as the displacement does not recur. Sometimes, although the uterus can be elevated fairly well, complete replacement is prevented by tubal or ovarian adhesions to the pouch of Douglas; the ovary can be felt tied down to the floor of the pouch and tethering the uterus, when the latter is carried forwards by the sound. In other instances replacement may be prevented by uterine adhesions. These cases are all unsuitable for treatment by pessaries, and other measures must then be adopted.

*Irreducible Backward Displacement.*—The symptoms met with in these irreducible cases are largely due to (1) the accompanying endometritis; (2) pelvic congestion resulting from inflammatory changes. The former can be relieved by curetting, the latter may yield to repeated courses of treatment with douches and vaginal tampons (see p. 615), or by repeated 'cures' at a suitable spa. The prospect of permanent relief by these means is, however, so remote that an operation for the cure of the displacement is, generally speaking, to be advised. Cases which, though reducible, have been treated without success by pessaries, can also be rightly advised to submit to operation. The procedures suitable are either shortening the round ligaments by one of the methods described on p. 566, or stitching the body of the uterus to the abdominal wall. Chronic inflammation of the adnexa may also be present, necessitating extirpation of, or a conservative operation upon, these organs also.

## PROLAPSE

There are three clinical varieties of genital prolapse: (1) prolapse of the uterus; (2) prolapse of the anterior vaginal wall (*cystocele*); (3) prolapse of the posterior vaginal wall (*rectocele*). The first and second often occur in company, either one or the other being the more pronounced, but each may be met with independently; the third as an independent condition is uncommon, but often occurs with cystocele. All varieties of prolapse are met with much more frequently in parous than in nulliparous women, and there can be no doubt that the results of child-bearing, such as laceration or relaxation of supporting structures, are the most important agents in their production. But child-bearing is not the only cause of prolapse, for it is occasionally met with in nulliparous women, both married and unmarried. Prolapse may be likened to hernia, for it consists in the protrusion of certain of the abdominal contents through an aperture in the supporting structures. The walls of this aperture may in some cases be congenitally weak, and the internal organs indifferently supported in their natural position ; prolapse may then occur without any actual injury having taken place ; or, on the other hand, prolapse may occur when the supporting structures are normal, owing to great increase of intra-abdominal pressure, as from a large tumour causing the uterus and vaginal walls to protrude.

In severe cases of prolapse a contributory factor almost always met with is *increased intra-abdominal pressure.* These cases, while comparatively rare in women of the better classes, are common enough in those who follow laborious occupations, or whose calling involves prolonged standing. Severe or long-sustained muscular effort, involving deep breathing and prolonged contraction of the abdominal muscles, naturally aggravates a hernial defect. Other slighter causes, such as chronic cough and constipation, produce a similar although less potent effect. The accumulation of fluid in the abdomen, and the growth of large intra-abdominal tumours, are also contributory causes of prolapse which operate in the same manner.

**Prolapse of the Uterus** may occur in three degrees. In the *first,* often called *descent,* the uterus lies below its normal level, but the cervix does not protrude from the vulva ; it is often accompanied by backward displacement. In the *second* degree the cervix protrudes in part or wholly from the vulva, and the body is always directed backwards. In the *third* degree, distinguished as *procidentia,* the whole uterus is expelled through the vulva, and the vagina is consequently inverted almost completely. In the recumbent position the first and second degrees become spontaneously reduced, but will be reproduced when the patient strains.

The structure of the hernial protrusion in cases of procidentia is shown in figs. 75 and 76, in sagittal mesial section. The protrusion forms an inverted cone, the apex of which is formed by the portio vaginalis with the external os ; the outer coat or covering of the hernia is formed by the wall of the vagina, which is completely inverted, and can be traced forwards to the urinary meatus and backwards to the perineal body. At the base of the hernia lie the mons Veneris in front and the anus behind. The sections show that the whole of the bladder and the whole of the uterus lie within the hernia. The posterior vaginal wall has been completely separated from the rectum; only a small portion of the anterior rectal wall is seen in fig. 76, while in fig. 75 it is seen that no part of the rectum has been drawn into the protrusion. The urethra runs almost vertically upwards from the bladder to the meatus. The anterior and posterior peritoneal pouches lie outside the

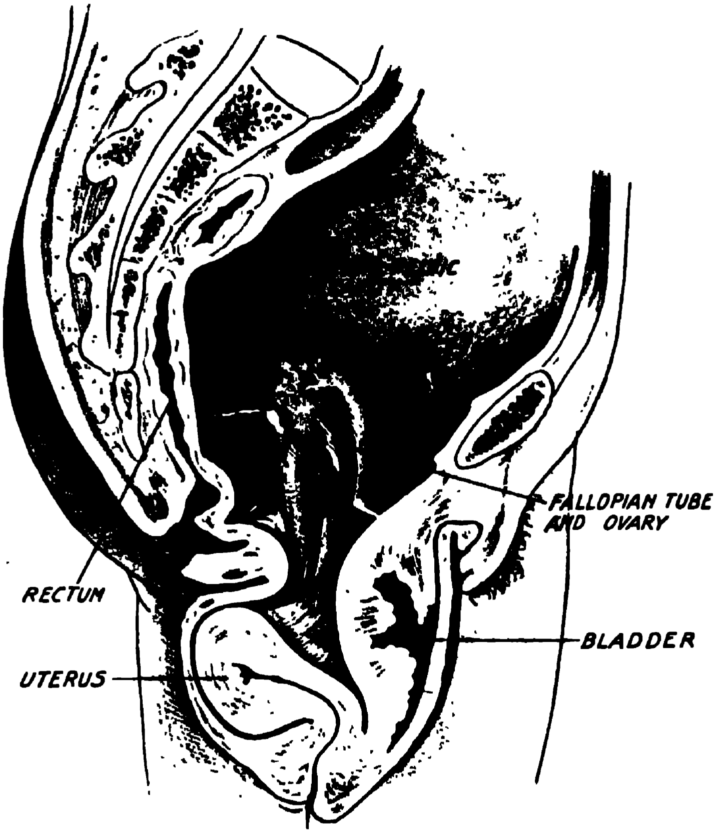

FIG. 75.—PROCIDENTIA UTERI, as seen in mesial sagittal section of the pelvis (Berry Hart).

body; the Fallopian tube and ovary lie at a much higher level than the uterus. It would obviously be possible,

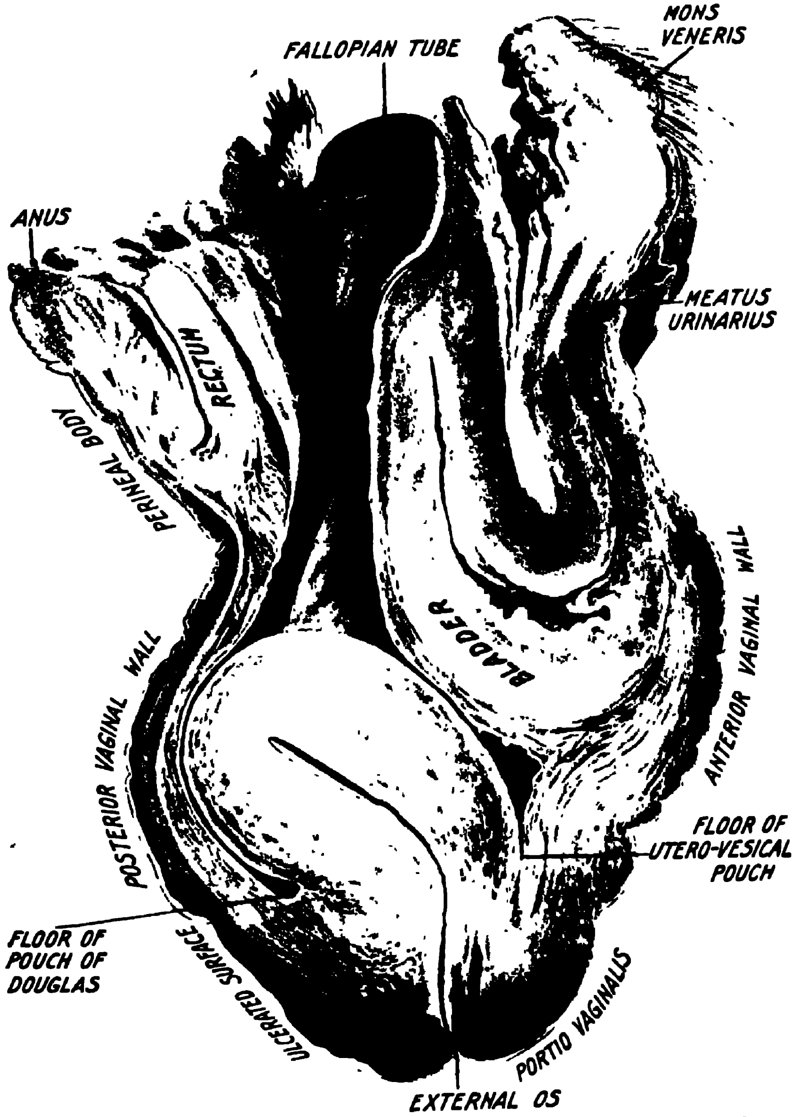

Fig. 76.—Procidentia Uteri, from a dissection. A sagittal mesial section has been made through the hernial protrusion to show its component parts. The thickening of the bladder wall is probably due to chronic cystitis (Charing Cross Hospital Museum).

during life, for coils of intestine or portions of omentum also to find their way into the peritoneal pouches.

It is not in all cases that the whole of the bladder passes into the hernia; in less advanced instances it is the base of the bladder only, the herniated portion forming a sac in which urine is liable to become stagnant. It is obvious from the marked displacement of the urethra that considerable mechanical difficulty must arise in evacuating the bladder.

In long-standing cases of the second and third degrees, certain *secondary* changes occur in the prolapsed parts. When the cervix protrudes a callous ulcer often forms upon the lips of the external os or upon some other part of the portio vaginalis (fig. 76). This may in part be due to friction against clothing or the inner aspects of the thighs; it is probably in part due to circulatory stasis, and thus corresponds to varicose ulcer of the leg. The vaginal walls become dry, and take on the general appearance of skin, except that none of the skin appendages are represented; the epithelium becomes thickened in chronic cases, and ulceration may occur as in the portio vaginalis. Elongation of the cervix is frequently found in cases of procidentia, sometimes affecting the vaginal, sometimes the supra-vaginal portion. As a rule this condition results from the prolapse, but sometimes it is a pre-existing abnormality and possibly a contributory cause. The body of the uterus is always retroverted in procidentia, and in old women it may be atrophied from post-climacteric changes. As a rule the hernia is reducible without difficulty; occasionally it becomes temporarily incarcerated from œdematous swelling of the parts; after a few days' rest in bed, however, reduction can always be effected in these cases.

The condition of the perineal body is an important anatomical point in connection with prolapse. Three degrees of perineal laceration are usually described. In the first the anterior half of the perineal body is involved; in the second the tear has extended up to, but has not included, the external sphincter ani muscle; in the third this muscle has been involved, the anus is partly incompetent, and a portion of the rectal mucous membrane often protrudes. In rare cases of prolapse, e.g. in nulliparæ, the perineal body may be found uninjured. Loss of the tissues of the perineal body does not necessarily cause prolapse of the uterus, as has been already mentioned; but one of its functions is to assist in closing the vaginal orifice, and the destruction of this function is certainly a predisposing cause of prolapse of the vaginal walls. Not infrequently the perineal body is injured on its deep (vaginal) aspect without much external sign of injury. On picking up its

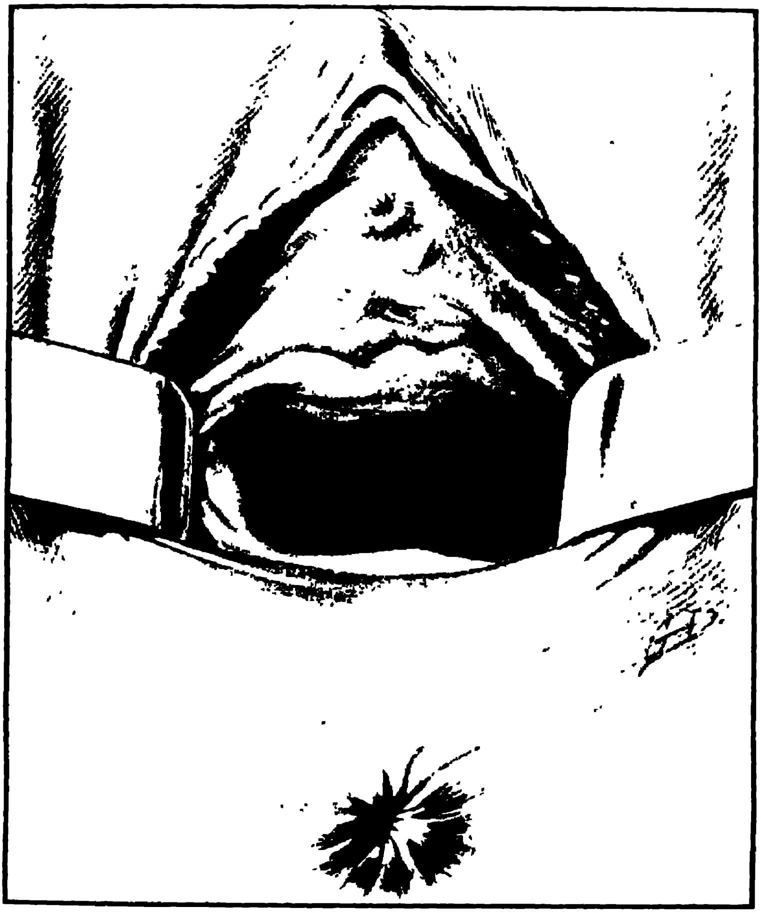

Fig. 77.—Relaxation of the Ostium Vaginal in a Parous Woman, due to laceration of the posterior vaginal wall. The skin surface of the perineal body is uninjured. (From a photograph.)

tissues between the thumb externally and the finger in the vagina, it will be found that the anterior part of the perineal body has been reduced to the thickness of stout paper. If the vaginal orifice is now opened by the fingers, a deep sulcus will be found in the posterior vaginal wall running upwards and to one side; sometimes there are two sulci of unequal depth, one on each side. On the floor of the sulcus an irregular line of cicatricial tissue will be found. The deep part of the perineal body has been destroyed by laceration extending into it from the posterior vaginal wall, and this internal injury weakens the vaginal orifice as much as an external one. In such cases very marked relaxation of the orifice may be present, so that it may be stretched sufficiently to admit four fingers without giving the patient pain (fig. 77).

Incompetence of the anus is one of the most distressing complications of prolapse, and careful attention should always be paid to the condition of the external sphincter. In its normal condition the presence of shallow radial folds of skin around the anus indicates its functional activity (fig. 77); when the anterior part of the muscle has been involved in a perineal laceration these radial folds, though still seen at the sides and posteriorly, are absent in front, the anterior wall of the anus being represented by a band of smooth cicatricial tissue. The ends of the torn muscle have retracted so that it is now horseshoe shaped, and the position of the retracted ends is often indicated by a shallow pucker or dimple in the skin on each side. As a rule the retracted ends are not precisely opposite one another (fig. 257).

**Prolapse of the Anterior Vaginal Wall and Bladder: Cystocele.**—In this condition the anterior vaginal wall, and with it the base of the bladder and the urethra, protrude from the vulva. The vaginal wall becomes stretched, and loses the characteristic transverse folds which are normally found, except in its lower part where they persist (fig. 257). A certain amount of descent of the uterus accompanies it, and in cases of uterine prolapse of the second degree, it will often be observed that when the patient strains the anterior vaginal wall and bladder come down first, and the cervix follows them. But well-marked cystocele may exist with only a slight degree of uterine prolapse, and this form may be met with in both parous and nulliparous women. The anterior fibres of the levator ani, which arise from the back of the pubes, form an important support to the anterior vaginal wall and bladder; cystocele is a protrusion of the bladder through the interval between the two levatores; accordingly injury to these muscles, or possibly congenital weakness, predisposes to the occurrence of this form of prolapse. In the recumbent position cystocele will not be obvious until the patient strains, when the protrusion at the vulva will at once appear. On vaginal examination, with the parts in their natural position, the anterior vaginal wall will be felt to be relaxed and elongated.

**Prolapse of the Posterior Vaginal Wall and Rectum: Rectocele.**—This form of prolapse is rare. When the vagina becomes inverted in complete prolapse of the uterus, the posterior vaginal wall in most cases becomes separated from the rectum, which hardly enters at all into the formation of the hernial protrusion. This is shown in figs. 75 and 76. In some cases, however, owing perhaps to inflammatory changes in the intervening layers of cellular tissue, the vaginal wall and the rectal wall become adherent to one another, and then, if the former becomes prolapsed, a portion of the rectum is dragged into the swelling, forming a rectocele. Considerable injury to the anterior wall of the perineal body is almost always met with in these cases, and in all probability it is this injury which results in morbid adhesion of the rectal and vaginal walls to one another.

Cases of prolapse are frequently encountered which consist of a combination of the different clinical varieties just described; the commonest association being uterine prolapse with cystocele.

**Symptoms of Prolapse.**—The symptoms to which prolapse of the uterus gives rise are variable, and often inconsiderable. In slight cases a feeling of weight or 'bearing down' is usually the only symptom present. In other cases even moderate degrees of prolapse give rise to constant dragging pain; this is aggravated by standing or walking, or by muscular effort of any other kind, and may become insupportable to women accustomed or required to lead an active life. Rest in the horizontal position will usually relieve this pain by correcting the displacement. On the other hand, in some cases of complete procidentia, the inconvenience caused by the bulk of the hernial protrusion is the only thing the patient complains of. Prolapse is a displacement of slow and gradual formation; it is during the early stages that pain is most prominent; when the displacement ceases to advance pain diminishes or disappears. The menstrual function is not affected, nor is the reproductive capacity much impaired, except in cases of procidentia.

Leucorrhœal discharge is commonly met with, and slight bleeding may occur from ulceration of the protruding parts. In cases of cystocele irritability of the bladder and frequency of micturition are often but not always complained of; sometimes the bladder is incompletely evacuated, and cystitis from decomposition of residual urine may then occur (fig. 75). In many cases the sphincter of the bladder is weakened, and slight dribbling incontinence occurs on coughing or muscular exertion.

**Diagnosis.**—It must be recollected that except in extreme cases prolapse disappears in the recumbent position, and in that position will only become evident when the patient strains; in order to observe the full extent of the displacement it is in some cases desirable to examine the patient in the standing position.

In all cases of prolapse the condition of the perineal body should be ascertained by careful inspection in a good light, noting the extent of the deficiency, if any, and the condition of the external sphincter ani; then by separating the labia gently with the fingers the degree of competence of the structures closing the ostium vaginae can be observed. In some cases these structures have completely lost their tone, and allow of the vulval aperture being widely dilated without pain. The anterior borders of the levatores ani should be examined when in contraction as described on p. 150. The patient should then be asked to strain, gently at first and then strongly; the alteration in the parts thus produced probably corresponds fairly well to the conditions which would be found in the erect position. If the protruded parts do not include the cervix, the finger should be passed into the vagina and the horizontal level of the external os carefully noted during straining and when at rest. Finally, an ordinary bimanual examination should be made of the body of the uterus, the tubes and ovaries, and the pelvic contents generally.

Protrusion of the cervix at the vulva is due either to prolapse, or to hypertrophic elongation of the cervix; not infrequently both conditions are present. Elongation of the vaginal portion of the cervix is easily recognised, as it can be both seen and felt; the differential diagnosis of prolapse from elongation of the supra-vaginal cervix will be referred to when considering the latter subject (p. 192).

The protruding cervix cannot with ordinary care be mistaken for any other structure, the presence of the external os at the lower end being absolutely distinctive.

In cystocele the lower part of the anterior vaginal wall comes down first, and when the patient strains it will be observed that the progress of the displacement is from below upwards. In well-marked cases the vaginal wall becomes greatly stretched, and a large protrusion may occur without the uterus being dragged down with it to any considerable extent. When distended by straining the transverse rugae disappear except in the lowest part of the vaginal wall which corresponds with the urethra. The continuity of the swelling with the vestibule shows it to be the anterior, not the posterior wall. The only condition which can be mistaken for it is a cyst of the anterior vaginal wall (see fig. 211); such cysts usually become prolapsed and then form a vulval protrusion resembling a cystocele. On replacing the cyst within the vagina its presence in the anterior wall will be detected by the examining finger on careful bimanual palpation; in cystocele when the vaginal wall has been replaced nothing but the general lax condition of the vaginal wall is observed. The use of a bladder sound will, of course, clear up any doubt that may remain. Similarly a rectocele may be distinguished from a prolapsed cyst of the posterior vaginal wall by rectal examination.

**Treatment.**—There are three possible lines of treatment for cases of prolapse: (1) rest and general massage; (2) pessaries; (3) operative measures.

1. Slight cases of prolapse occurring in young women, detected soon after confinement and associated as they often are with 'subinvolution,' are often curable by putting the patient to bed for three or four weeks and taking measures to improve the general muscular condition. Daily massage by a skilled person, with passive exercises, attention to the daily evacuation of the bowels, and the administration of such tonic remedies as strychnine and iron, are the points of greatest importance. As the weight of the uterus diminishes, and the general muscular condition improves, the prolapse may be permanently cured; or alternatively the advance of the displacement may be arrested, and the symptoms permanently relieved. This method is

not applicable to old-standing cases or to those of the second and third degrees.

2. *Pessaries.*—Gynaecologists of an earlier generation devised vaginal pessaries which are capable of keeping the uterus within the body under almost all circumstances, if their presence can be tolerated by the patient. In the case of some of them, the discomfort of the pessary is greater than that of the prolapse, and in addition their continued use is liable to cause serious ulceration, leading sometimes to perforation of the vaginal walls, opening up the bladder, the rectum, or the peritoneal cavity. No useful purpose would

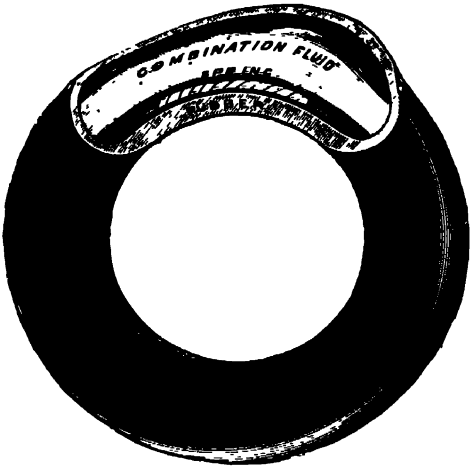

FIG. 78.—THE WATCH-SPRING RING PESSARY.

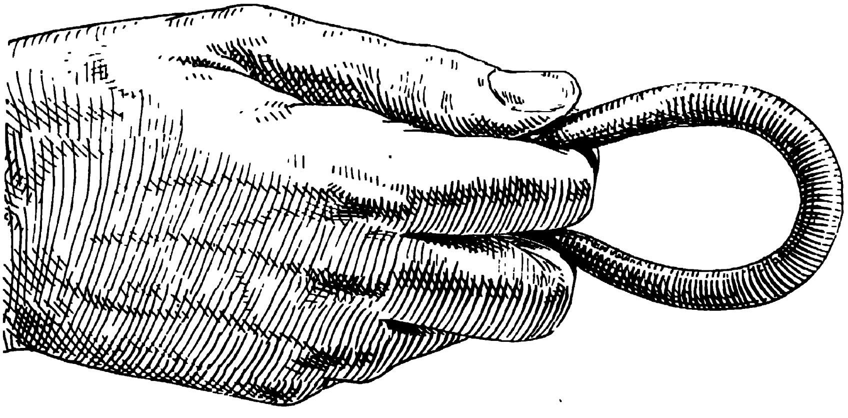

FIG. 79.—HOW TO HOLD THE RING PESSARY FOR INTRODUCTION.

be served by describing these obsolete instruments; the conditions under which they were formerly resorted to are now dealt with more satisfactorily by operative measures.

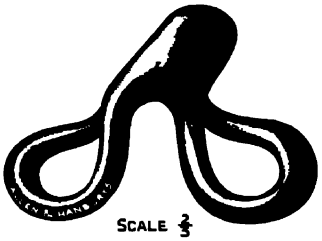

FIG. 80 — GRAILY HEWITT'S CRADLE PESSARY FOR CYSTOCELE

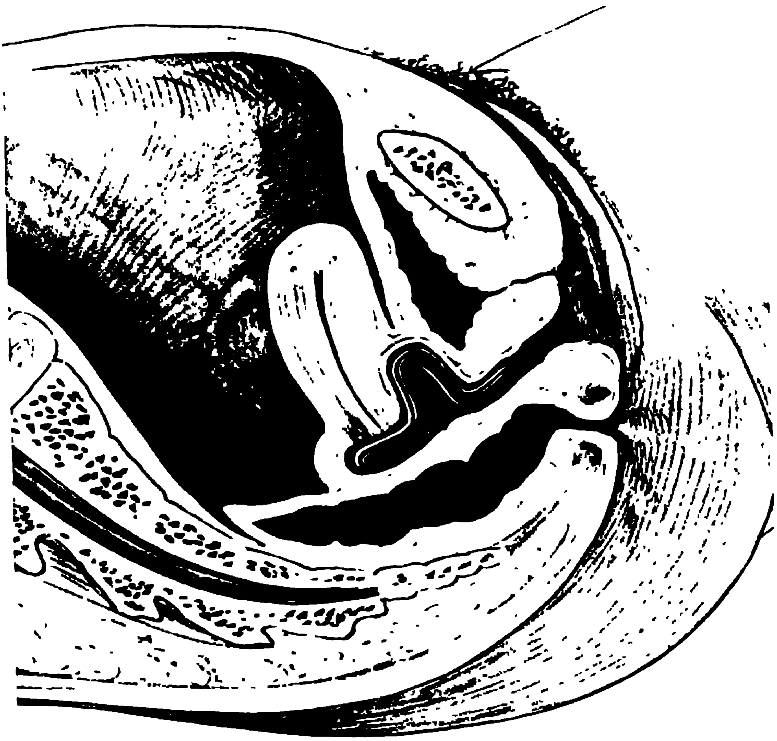

FIG 81 THE CRADLE PESSARY IN POSITION IN THE VAGINA (diagrammatic).

Prolapse cannot be cured by wearing a support, as is the case with some instances of backward displacement. The pessary is used to relieve symptoms, and to check the natural tendency to increase of the condition. It is in cases of prolapse of the uterus of the first and second degrees that a pessary will be found most useful, and the elastic (watch-spring) rubber-covered ring is the instrument which will be found most generally useful (fig. 78). It must be recollected that these pessaries are unsuitable for cases in which the retentive power of the vagina has been completely lost through extensive laceration of the perineal body, or through relaxation of the ostium vaginae. Unless the structures which close the vaginal aperture retain much of their natural competence, the pessary will be expelled by muscular efforts such as straining at stool, or even when walking. The pessary cannot be worn in comfort if such conditions as inflammation or ulceration of the vaginal walls are present.

In selecting a ring pessary for such a case it is important to use the largest size which can be retained without discomfort, the action of the pessary being so to stretch the vaginal canal in its transverse diameter that a certain amount of tension is put upon the walls, and prolapse thus becomes impossible. Its action in supporting the uterus is mainly indirect, for while the upper parts of the vaginal walls remain in their normal position only slight descent of the uterus is possible. To introduce the ring pessary, the patient should lie upon her side or her back with the thighs flexed ; the *clean* instrument is then held in the right hand, the index finger being passed through the ring in the manner shown in fig. 79. The ring, thus compressed to an oval shape, is introduced in the antero-posterior diameter of the ostium vaginae, being directed at first backwards towards the sacral hollow. When rather more than one half of the instrument is inside, it may be allowed to expand, and then pushed gently upwards ; rotation into the transverse diameter now occurs spontaneously, and the index finger should be slipped up the posterior vaginal wall so as to guide the upper part into position *behind* the cervix. The lower part should now lie behind the lower border of the symphysis pubis, and the instrument should be of sufficient size gently to stretch the anterior vaginal wall. A little experience is necessary to estimate rightly the degree of tension which is necessary for success, and which does not occasion discomfort. This instrument does not interfere with marital intercourse.

In cases of cystocele a ring pessary is not successful, for the anterior vaginal wall and bladder will protrude through it if the cystocele is of considerable size. Ring pessaries with a perforated rubber diaphragm are sometimes used for this purpose, but this device is objectionable as it prevents the proper escape of the uterine and vaginal secretions and interferes with coitus. A Hodge or a cradle pessary may be employed for this condition. The method of introducing the former has been already described (p. 164); its usefulness in cases of cystocele may be somewhat increased by the addition of transverse bars at the lower end which prevent any portion of the cystocele from protruding through the instrument. The cradle pessary is shown in fig. 80; it consists of a solid bar forming the apex of the instrument from which pass an anterior and a posterior curved loop, the latter being somewhat larger than the former. It is introduced in the transverse diameter of the vulva, and the posterior loop is passed backwards along the posterior vaginal wall. When introduced the apex of the pessary lies in the anterior fornix, the posterior loop encircles the cervix, the anterior loop lies against and supports the anterior vaginal wall (fig. 81). This instrument is efficient, but has the disadvantage of obstructing the vaginal canal, so as to interfere with marital intercourse.

Cases of prolapse in which the retentive power of the vagina has been lost are, generally speaking, unsuitable for treatment by pessaries, and in almost all cases operative measures should be advised. Sometimes, however, in such cases the patient may decline to submit to operation, in others operation may be undesirable on account of advanced age or for some other reason. In these circumstances mechanical support may be afforded by the Napier or the Zwancke pessary. These are the only instruments which will be of any avail in cases of procidentia with complete loss of retentive power from perineal laceration or relaxation of the vulva.

The Napier pessary (fig. 82) consists of a thick but flexible rubber stem terminating above in a shallow rubber cup; when introduced the cervix rests upon the cup, which is perforated to allow of the escape of discharges. The stem is of sufficient length to allow the lower end to lie outside the vulva. Through this end are threaded two rubber bands, and to each end of the bands tapes are attached. The tapes are passed, two forwards over the pubes and two backwards over the coccyx, to be fixed to a belt round the waist. By adjusting the tension of the tapes, elastic pressure in an upward direction is exerted upon the instrument through the rubber bands, and in this way the descent of the uterus or the vaginal walls is prevented. This instrument should be worn only in the day, and removed each night and a vaginal douche used; before re-introducing it the instrument should be thoroughly cleansed by boiling or by immersion in 1/20 carbolic lotion. The continued use of this pessary cannot be advised unless these precautions are taken, but its management is readily learned by the patient herself or an attendant. Neglect of these precautions may lead to serious ulceration of the vagina; and inasmuch as the precautions cannot be enforced, cases in which it is recommended must be carefully selected.

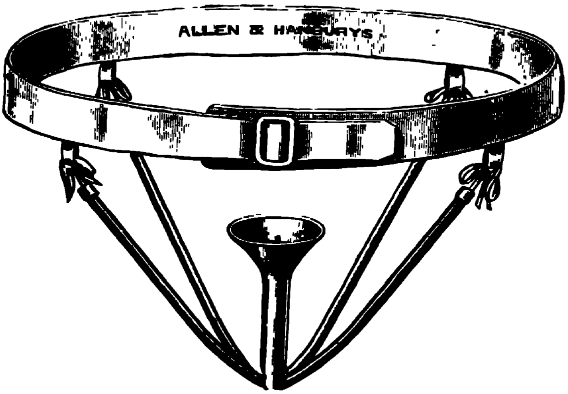

Fig. 82. Napier's Pessary for Prolapse.

The Zwancke pessary is shown open and closed in fig. 83. In introducing it the wings are approximated and passed in the antero-posterior diameter within the vulva; on closing the legs of the instrument the wings are separated, and, lying in the transverse diameter of the pelvic outlet, they receive support from the inner surfaces of the ischial tuberosities against which they rest. The instrument must be worn only in the day, and removed each night for douching and for cleansing. It is not so easily managed by patients as the Napier pessary, and is more likely to cause ulceration.

3. *Operative measures* for prolapse include the following procedures :

(1) Perineorrhaphy ;
(2) Anterior colporrhaphy ;
(3) Colpo-perineorrhaphy ;
(4) Ventrifixation.

The description of these operations will be given in a later section, but the indications for each may here be briefly mentioned. Perineorrhaphy is indicated when the perineal body has been considerably injured, or when the ostium vaginae has become relaxed so that its retentive capacity is diminished or lost. Its object is to restore the vaginal outlet, and in addition when necessary, to repair the anal sphincter. In cases where the posterior vaginal wall is prolapsed perineorrhaphy may be combined with the removal of a portion of the redundant vaginal mucous membrane—colpo-perineorrhaphy. Anterior colporrhaphy is practised in cases of cystocele, and consists in stripping the prolapsed vaginal wall from the subjacent bladder and removing as much of the redundant mucous membrane as may be necessary. In cases of procidentia it is desirable to perform ventrifixation of the uterus as well, and thus support the prolapsed organs from above. Indeed, in such cases an extensive operative procedure may be necessary,

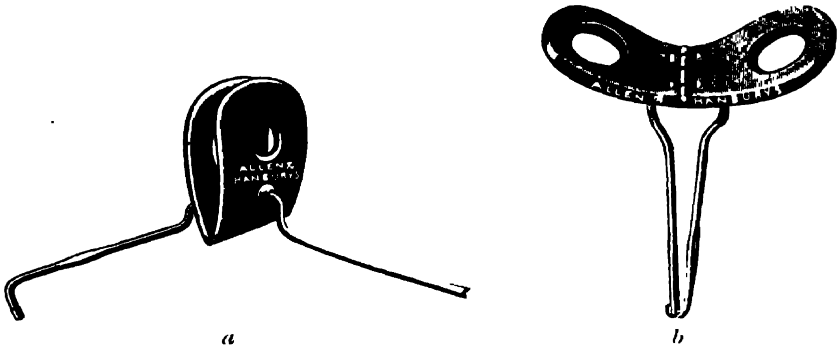

FIG. 83.—ZWANCKE'S PESSARY FOR PROLAPSE. *a*, Closed for introduction ; *b*, open, as when introduced.

including amputation of the elongated cervix, anterior colporrhaphy, perineorrhaphy and ventrifixation.

The permanent results of these operative measures for prolapse are good, if primary union of the plastic operations is secured. There is, of course, a certain tendency to stretching of the cicatrices, and in anticipation of this the constricting plastic operations should be carried to a point of slight exaggeration. The part most likely to suffer stretching is the anterior vaginal wall; anterior colporrhaphy should therefore in all cases be supplemented by perineorrhaphy in order to afford the repaired anterior wall all possible support from below. Unless this is done the operation is very likely to prove a failure. Ventrifixation alone is useless for prolapse, but when combined with the plastic operations mentioned it becomes of great service.

**Chronic Inversion of the Uterus.**—This condition is one of great rarity. In something like 90 per cent. of cases it is puerperal in origin and begins as an acute inversion. In the remainder it is non-puerperal and associated with the presence of a tumour, most commonly a submucous fibroid, growing from the fundus or upper part of the body of the uterus. Sarcoma appears to produce this result with relatively greater frequency than a fibroid; but the latter is of much commoner occurrence than the former. The weight of the tumour and the dilatation of the uterine cavity which it produces are the predisposing factors; when a small portion of the uterine wall has been dragged inwards by the growth, the progress of the displacement is affected by uterine contractions which dilate the cervix and expel the tumour through it. The inversion is seldom complete in these cases, but may be so in rare instances as in fig. 84. Puerperal cases, on the other hand, are usually complete; the cervical canal may be partially retained, as in fig. 85, or the whole of the cervix together with the upper part of the vagina may also be inverted.

The prominent *symptom* of chronic inversion is irregular hæmorrhage, dating in puerperal cases from the last confinement; the bleeding may be very severe and has sometimes proved fatal. In addition the patient may complain of the presence of a tumour, or of the womb 'coming down.' The diagnosis can only be made by physical examination, and while in complete puerperal cases this is very easy, in partial cases associated with a tumour, great care is required to avoid mistakes.

The *completely inverted* uterus forms a pyriform swelling, occupying the vaginal canal, or protruding through the ostium vaginae. It is smooth, dark red in colour, and usually bleeds readily on being handled. The orifices of the interstitial portions of the Fallopian tubes can seldom be distinguished. On passing the examining finger upwards, a constricting ring may be felt surrounding the neck of the swelling (fig. 85); this represents the external os, and shows that the cervical canal is not completely inverted. If the

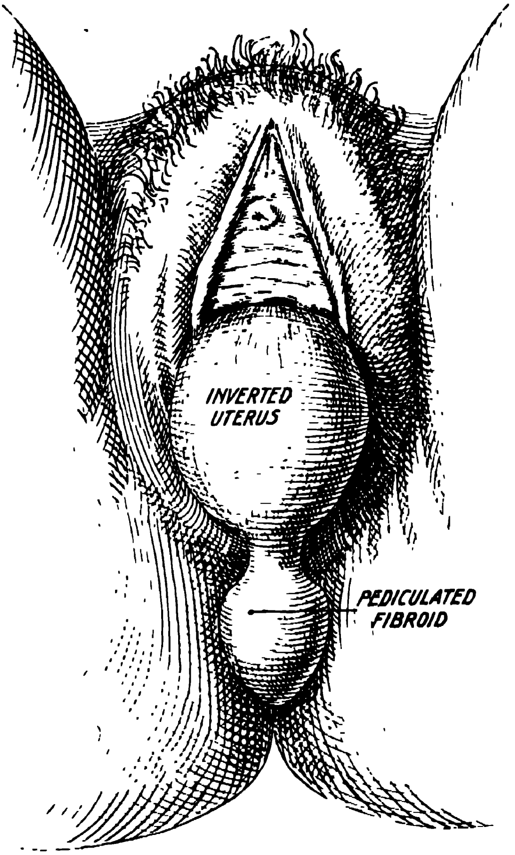

FIG. 84.—COMPLETE INVERSION OF THE UTERUS DUE TO A FIBROID TUMOUR ATTACHED TO THE FUNDUS (diagrammatic, after Schafer).

cervix has also been completely inverted, no constricting ring is felt, and the finger meets the resistance of the vaginal *cul-de-sac* all round. Bimanual examination will reveal the absence of the uterus from its normal position ; the recto-abdominal method is the most suitable, as the vagina is occupied by the inverted uterus. In cases of doubt a sound may be passed into the bladder, and the point being directed

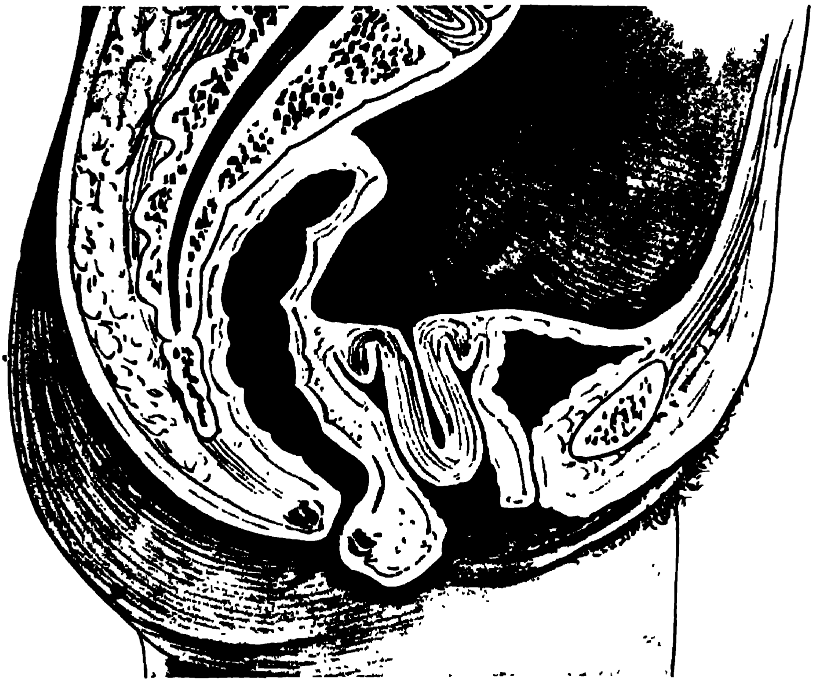

FIG. 85.—INCOMPLETE CHRONIC INVERSION OF THE UTERUS (diagrammatic, after Haultain). The tube and ovary are seen lying above the inverted uterus.

backwards may be made to meet the finger in the rectum directed forwards. Next to the absence of the uterus, the most important point is the recognition by abdominal examination of the constricting ring through which the inversion has taken place (fig. 85) ; under anæsthesia this can always be felt, and its recognition is also an important point in regard to reduction of the displacement. This ring forms the entrance to the internal or peritoneal cavity of the inverted uterus ; in recent puerperal cases this cavity may contain the tubes and ovaries, or a coil of intestine ; in chronic cases, owing to retraction of the uterine tissues, the cavity shrinks and its contents recede (fig. 85).

There are two other conditions in which a large pyriform, bleeding swelling may be found occupying the vagina, and their differential diagnosis from inversion is a matter of considerable importance. These conditions are: (1) a large fibroid polypus; (2) carcinoma of the cervix. In both of these cases, when a careful bimanual examination is made, if necessary under anæsthesia, the body of the uterus will be found to occupy its normal position. In the case of the polypus, its stalk can generally be felt *per vaginam*, but this may conceivably be mistaken for the neck of the inverted uterus; the uterine cavity is, however, open, and a sound may be passed into it along the side of the polypus. In cases of carcinoma of the cervix with formation of large masses of new growth (see p. 202), the cervical canal cannot be identified, but a careful bimanual examination will reveal the presence of the body of the uterus lying above the swelling in the vagina.

When inversion is due to the presence of a tumour attached to the fundus the diagnosis is naturally more difficult, since the inversion as a rule is incomplete. In cases such as these operation for removal of the tumour *per vaginam* is attended by considerable risk of cutting through the uterine wall, unless, by a careful bimanual examination, the partial inversion has been previously recognised.

*Treatment.*—Puerperal cases when recent are to be treated by manual reduction of the inversion; this procedure is described in text-books of midwifery. After some time has elapsed the inversion is much more difficult to reduce, and continuous elastic pressure is required to overcome the resistance offered by the inversion ring. The best method of applying this pressure is by the *repositor* of Aveling shown in fig. 86. The vulcanite cup (*a*) fits over the fundus of the uterus; the cup is continued below into a rigid curved stem (*b*) to which four strong rubber bands are attached; these are in turn fixed by tapes to an abdominal girdle, or preferably to shoulder straps (*c*); the cup is thus held in contact with the fundus, and by stretching the rubber bands continuous elastic pressure in an upward direction is applied through the stem to the inverted uterus. Considerable discomfort attends the use of the repositor, and the treatment must therefore be applied intermittently, as the patient is able to bear it. The process of replacement must be carefully watched, and the cup may be removed before reduction is quite completed, for the last part of the process will occur spontaneously. If this precaution is not adopted, the cup may be carried inside the replaced uterus, and great difficulty may be encountered in extracting it through the narrow cervix. This method of replacement is usually successful.

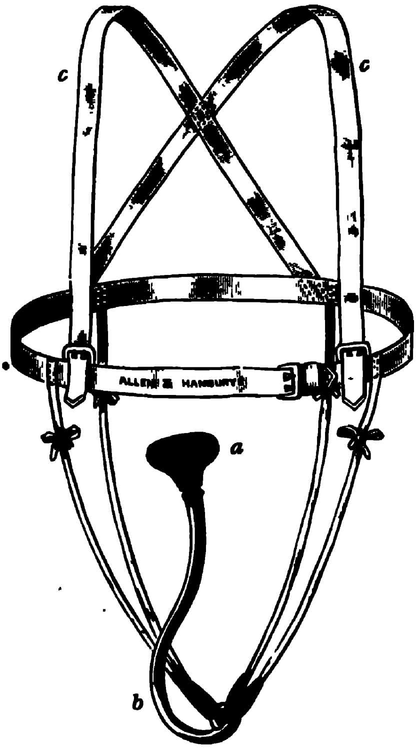

FIG. 86.—AVELING'S REPOSITOR FOR CHRONIC INVERSION.

In the event of failure two operative methods of reduction are available: (1) The abdomen may be opened, the inversion ring dilated or incised, and the displacement then reduced by steady digital pressure from the vagina by an assistant. (2) By a vaginal operation (Küstner) the posterior wall of the uterus may be incised from near the fundus up to the vaginal fornix, so as to open the peritoneal cavity of the inverted uterus. This will allow of the uterus being re-inverted, when of course it passes out of the vagina altogether. The incision in the posterior vaginal wall is then prolonged sufficiently to allow the reduced uterus to be *retroverted* into the vagina, when the incision can be closed. The uterus is then returned into the peritoneal cavity and the vaginal incision finally stitched.

Cases of inversion due to a fibroid tumour should be treated first by removal of the tumour, and then by replacement of the inversion. In the event of the tumour being malignant the best procedure to adopt would be vaginal hysterectomy.

## HYPERTROPHIC ELONGATION OF THE CERVIX

The cervix may become elongated in either its vaginal or its supra-vaginal portion (see fig. 7); the change is not due to stretching, but to new formation of tissue, i.e. the elongation is hypertrophic. Elongation of the vaginal portion is as a rule congenital, and is often seen in young virgins. Elongation of the supra-vaginal cervix is frequently, but not always, acquired; in its minor degrees it is associated with prolapse of the uterus, in its extreme form it produces complete prolapse (eversion) of the vagina (see fig. 88).

Clinically speaking, hypertrophic elongation of the cervix is closely allied to prolapse, and for that reason may be conveniently considered at this point.

### ELONGATION OF THE VAGINAL CERVIX

The cervix presents at, or protrudes from, the vulva, and the condition may therefore be mistaken for prolapse of the uterus (fig. 87). It is, however, most commonly seen in nulliparous women in whom prolapse is uncommon. On internal examination the fundus of the uterus will be found at its usual level, i.e. the organ is not prolapsed; also the vaginal fornices are not depressed; the vaginal canal is occupied by a long cylindrical body, at the apex of which is found the os externum; and the length of the uterine cavity as determined by the sound may be increased up to four or four-and-a-half inches. The diagnosis is accordingly a matter of great simplicity.

The condition causes discomfort from the mechanical effects of the vulval protrusion, and is also apt to give rise to a good deal of mental distress. Married women complain that coitus is difficult, and there is no doubt that the condition is a serious hindrance to conception, owing to the unfavourable position of the entrance to the cervix. No other symptoms are met with, as the general relations of the other pelvic organs are unaffected.

The *treatment* is to amputate the cervix by the method which will be described in a later section (see p. 580).

## ELONGATION OF THE SUPRA-VAGINAL CERVIX

This condition is illustrated in fig. 88, which represents an extreme form of this variety of elongation. It will be observed that the whole uterus—both body and cervix—is lengthened; in the specimen the organ measured 6¼ inches from fundus to os externum; 3¾ inches representing the body, and 2½ inches the cervix. The anterior and posterior vaginal walls are completely everted. The vaginal portion of the cervix has disappeared, the lips of the os externum being flush with the vaginal walls. The anterior and posterior peritoneal pouches are depressed greatly below their normal level, in the same manner as occurs in procidentia uteri (compare fig. 75). The displacement of the bladder and urethra is, however, much less considerable than that met with in procidentia. The everted vaginal walls and the lower part of the cervix are greatly thickened.

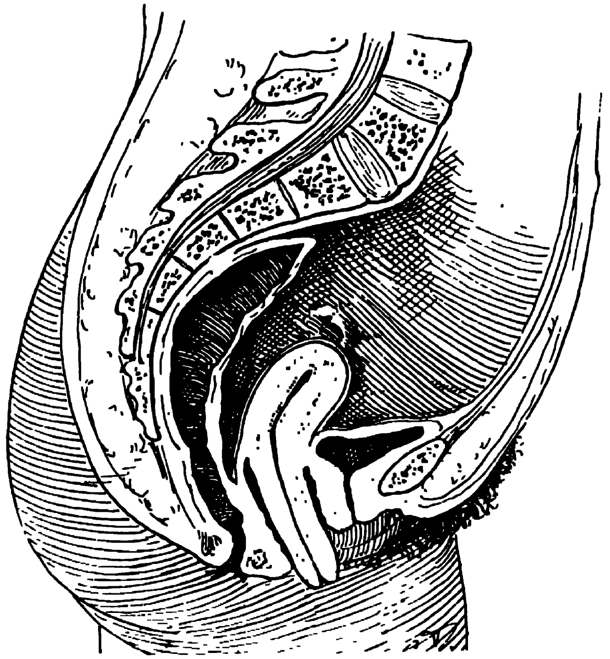

FIG. 87.—HYPERTROPHIC ELONGATION OF THE VAGINAL PORTION OF THE CERVIX (diagrammatic).

The body of the uterus is partly retroverted, and owing to the elongation which it has undergone, the fundus is not much below its normal level; but the walls of the uterine body are thinned.

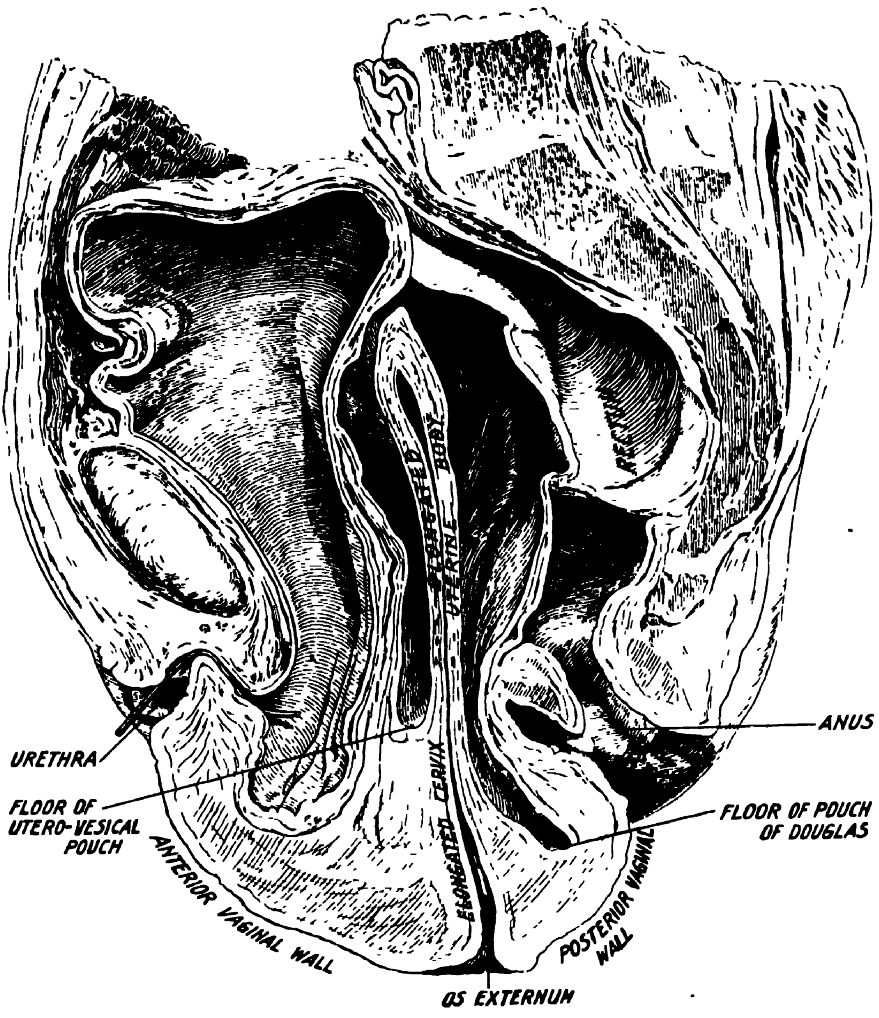

FIG. 88.—COMPLETE PROLAPSE OF THE VAGINA WITH ELONGATION OF THE UTERUS (Museum of Royal College of Surgeons). The vaginal walls have been completely everted and greatly thickened. The uterine body measured 3¾ inches, the cervix 2½ inches in length.

This form of elongation of the cervix is met with almost solely as an accompaniment of prolapse, and in all probability it directly results from this displacement. Clinically it is recognisable by direct palpation, and by measuring the length of the uterine cavity. By the latter method, lengthening of the body cavity cannot be distinguished from lengthening of the supra-vaginal cervix ; but by palpation of procident mass, or by combined rectal and vaginal palpation in less advanced cases, a long cylindrical portion of about the thickness of the finger can be recognised and traced upwards to join the expansion formed by the body. It will be obvious that cases such as that shown in fig. 88 would be regarded as simple instances of procidentia if the condition of the uterus and the level of the fundus were not carefully examined.

The *treatment* is that of prolapse of the uterus. As the elongation is secondary to the prolapse, it is probable that minor degrees of lengthening may disappear spontaneously when the displacement has been corrected. In extreme degrees of lengthening it is desirable to amputate a portion of the elongated supra-vaginal cervix (see p. 580) along with the vaginal portion.

## ENDOMETRITIS

This subject will be considered under the following headings :

I. Acute endometritis.
II. Chronic infective endometritis.
III. Chronic non-infective endometritis.
IV. Subinvolution.
V. Exfoliative endometritis : Uterine casts.
VI. Senile endometritis.

A good deal of confusion prevails upon the pathological aspects of endometritis. For many years the views of Ruge, elaborated afterwards by Gebhard, have been almost universally adopted. Briefly these views were that a chronic inflammatory process was frequently met with in the endometrium ; that in some cases it affected the glands (glandular endometritis), in others the stroma (interstitial endometritis), and in others both glands and stroma (mixed endometritis). This view was developed by Gebhard, who described two forms of glandular endometritis: one in which the number of glands actually increased by proliferation, either from the surface epithelium or from pre-existing glands (hypoplastic form); and one in which no new formation of glands occurred, but those existing increased in length and breadth, and accordingly became greatly altered in outline (hypertrophic form).

The work of Hitschmann and Adler already referred to (p. 20) raises doubt as to whether the conditions previously described as *glandular* endometritis, are not in reality changes normal to the premenstrual phase of the menstrual cycle. Fresh observations will be required to distinguish accurately normal from pathological glandular changes, and this point must in the meantime be left an open one.

The study of *interstitial* endometritis has also been greatly retarded by the fact that round cells (lymphocytes) occur in variable numbers in the normal endometrium, and until recently no histological method was known by which they could be certainly distinguished from round cells of inflammatory origin. The recent discovery in inflammatory effusions of *plasma* cells and of their special tinctorial characters has, however, furnished a means of recognising inflammatory processes in the stroma of the endometrium with certainty; when these cells are absent the condition is, in all probability, non-inflammatory. The question whether there is a true inflammatory element in either of the forms of chronic endometritis described by Ruge may be expected shortly to be settled. It will be understood that the description of the pathology of endometritis which follows is a tentative one only, and likely before long to require revision.

The endometrium may be attacked by inflammatory processes either acute or chronic. Acute endometritis is in all cases infective, i.e. of bacterial origin. Chronic endometritis is also in some cases infective, but in the great majority of instances no evidence of bacterial infection exists. These non-infective cases form a large and important clinical group in which the histological evidences of inflammation are scanty, and unlike those found in other mucous membranes as the result of chronic inflammatory processes. Changes of the nature of hyperplasia or hypertrophy predominate greatly over the inflammatory changes, and it may be, therefore, that new formation, not inflammation, is the essential feature. In the present unsettled state of our knowledge the old name of chronic endometritis may be conveniently retained as the general designation of all these conditions, distinguishing between *chronic infective endometritis* and *chronic non-infective endometritis.*

## ACUTE ENDOMETRITIS

This occurs as the result of septic or gonorrhœal infection; the former is generally puerperal, arising in connection with abortion or with labour; but it may also be set up by the introduction of foreign bodies, or of septic surgical instruments, into the uterus; acute endometritis is one of the rarest complications of gonorrhœa, although in its chronic form the same kind of infection is common. An exfoliative or 'diphtheritic' form of acute endometritis may also occur in general septicæmia; a false membrane is produced which may be shed, and the infecting organism in these cases is believed to be the streptococcus, not the bacillus, of Löffler. An acute inflammation of the endometrium speedily spreads to the subjacent muscular layer, when the condition becomes one of *acute metritis.* Further extension of the inflammation will involve the peritoneal coat of the uterus, and thence spread to the pelvic peritoneum generally.

The clinical course of acute endometritis can seldom be closely observed owing to the fact that it is met with only as a complication of an already acute illness. The greater number of cases come under the care of the obstetrician as cases of puerperal infection. Under other circumstances the general features of the condition are indistinguishable from those of *acute pelvic inflammation* (see p. 423), as the infection rapidly spreads from the uterus to the other pelvic organs.

## CHRONIC INFECTIVE ENDOMETRITIS

Three varieties of this condition, viz. gonorrhœal, tuberculous, and septic, can be recognised. The former w[illegible] considered in connection with the subject of gonor[illegible] ce

p. 436). Deposits of tubercle in the endometrium are rare, and the condition will be again referred to in the section on tubercle of the genital organs (see p. 444). The last-named is of comparatively frequent occurrence, and usually results from septic infection in the puerperium; as a rule the infection is chronic from the beginning, but may in some cases begin acutely. It is almost invariably associated with other lesions having the same origin, such as inflammation of the tubes and ovaries, and of the pelvic peritoneum. These lesions, which, in their sequence, are secondary to the endometritis, are of greater clinical importance and consequently receive more attention. The symptoms due directly to the condition of the endometrium are difficult to disentangle from those due to the secondary lesions, but a muco-purulent discharge is usually present which is the direct outcome of the endometritis. The subject will be again referred to in connection with chronic pelvic inflammation, for in the treatment of this condition it is of great importance that the state of the uterus should not be overlooked.

Cases of chronic infective endometritis, occurring after abortion or child-birth, are often attended with retention of portions of chorion or of decidual tissue, which may be detected on examination of the material removed by curetting (fig. 96). Chronic infection of the cervical endometrium is in almost all cases gonorrhœal, and will be described in connection with gonorrhœa.

## CHRONIC NON-INFECTIVE ENDOMETRITIS

For clinical purposes it is convenient to consider separately endometritis of the body and of the cervix. It is true that they cannot be regarded entirely as distinct affections, for both body and cervix are usually involved; but as a rule they are not affected to an equal extent—sometimes one, sometimes the other, showing the more marked changes.

**Corporeal Endometritis: 'Endometritis.'**—This condition is usually spoken of simply as 'endometritis,' the corresponding affection of the cervix being called *cervical endometritis*. Following the classification of Ruge two types may be distinguished: one in which the glands show the most marked changes—*glandular endometritis*, and one in which the stroma is chiefly affected—*interstitial endometritis*.

*Glandular Endometritis.*—The mucosa is always thickened in this condition, and may attain a depth of one-third to half

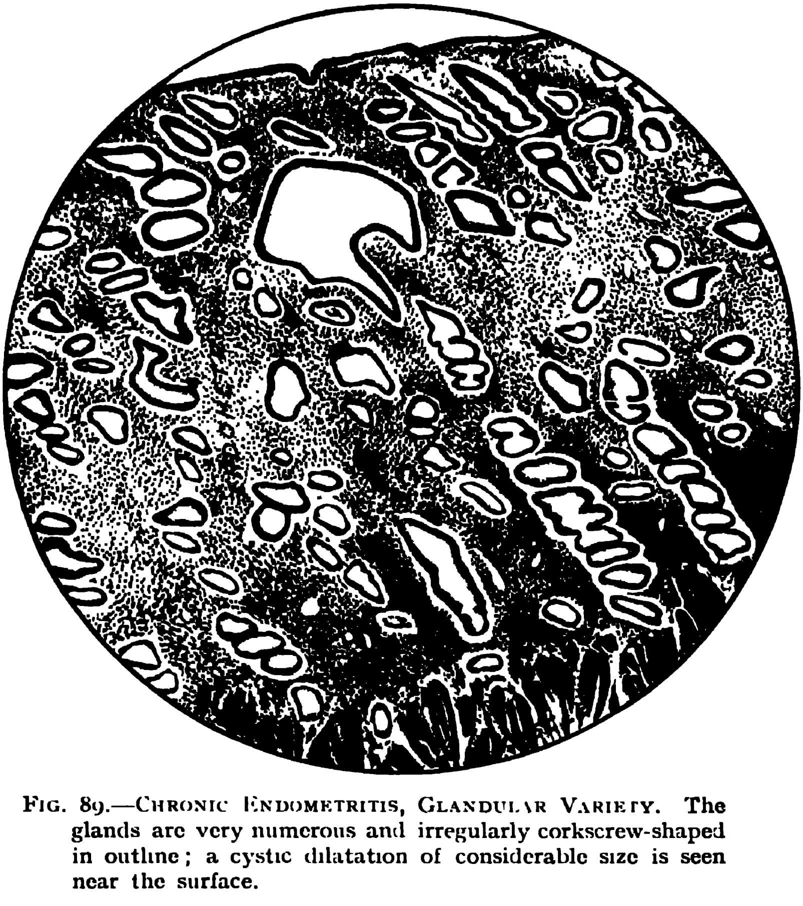

FIG. 89.—CHRONIC ENDOMETRITIS, GLANDULAR VARIETY. The glands are very numerous and irregularly corkscrew-shaped in outline; a cystic dilatation of considerable size is seen near the surface.

an inch. Its surface is pale and smooth, and sometimes shows small translucent elevations representing dilated portions of deep glands. On microscopic examination the glands are found to be numerous and placed close to one another, but adjacent lumina are never in contact, being always separated by a layer of stroma (fig. 89). Seen in longitudinal section the glands display wavy or crenated outlines, a change which is clearly due to increase in length of the tubule (fig. 90);

in many parts dilatation has also taken place, and sometimes small cystic cavities of irregular shape are formed. The

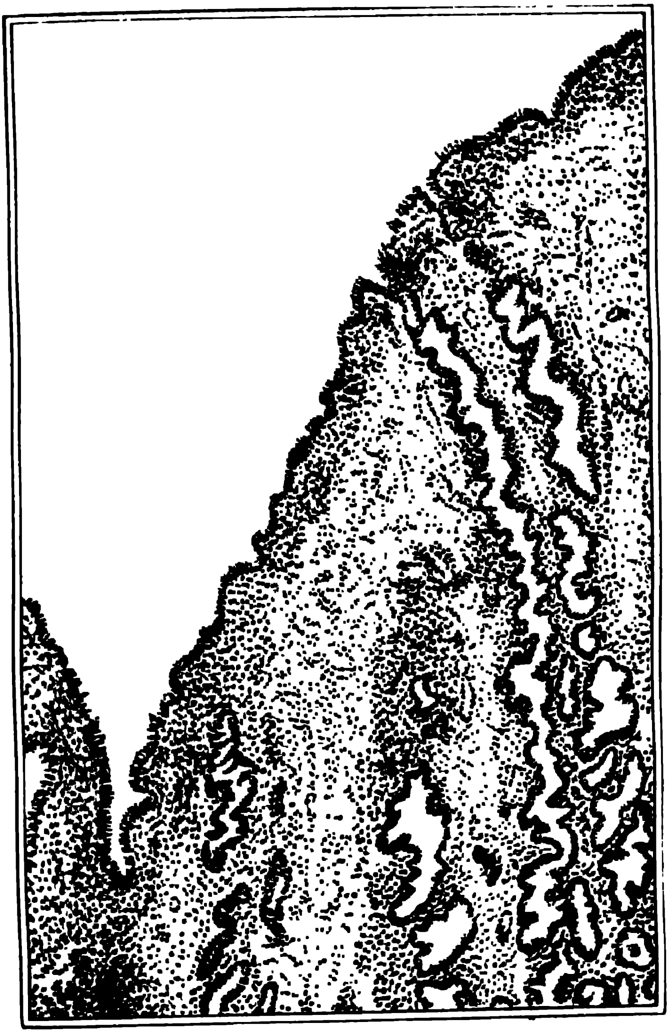

FIG. 90.—CHRONIC ENDOMETRITIS, GLANDULAR VARIETY. The section shows an elongated gland crenated in outline, seen under a high power. The small gland on the left shows the epithelium budding into the lumen. The stroma is œdematous.

glands also show epithelial budding internally, i.e. into the lumen, and frequently portions of the gland become invaginated after the manner of an intussusception; such parts appear on section as a double ring of epithelium. The gland epithelium shows no alterations, but remains single-layered and columnar. The epithelium covering the surface of the endometrium is also unaltered; it is rare to find any part of this layer shed (fig. 90). The stroma is, generally speaking, increased in amount, but owing to the great increase in the number of glands, it appears to be relatively less than the normal, as sections of the gland lumina stand closer together. Usually isolated patches of round-celled infiltration can be found in the stroma, with here and there dilated capillaries and interstitial hæmorrhages. Another change frequently found is œdema, indicated by separation of the cells of the stroma by clear spaces as in fig. 90. The vascularity of the mucosa is not greatly increased.

*Interstitial endometritis* is much less commonly met with than the preceding form. It consists in an increased formation of the stroma of the endometrium, resulting in secondary changes in the glands. In the early stages the mucosa is thickened and increased in vascularity, and shows extensive round-celled infiltration and many dilated capillaries; this stage probably lasts but a short time and is succeeded by a second in which the membrane is thinner than normal. It is in this stage that it more commonly comes under clinical observation.

Microscopic sections show a great decrease in the average numbers of gland tubules in the microscopic field, and further, the tubules are often somewhat distorted in shape (fig. 91). The surface epithelium is shed in patches, and the remaining cells may be cubical instead of columnar. Sometimes small cystic dilatations of glands are formed by compression of a duct by the surrounding stroma. The stroma is relatively very abundant, and to the multiplication of its cells are due the wide separation of the glands and the alterations in their outlines. The stroma has also lost its special characters, and consists either of well-developed fibrous tissue or, as often happens, of degenerated and œdematous connective tissue. The connective tissue cells are often larger than normal and may resemble decidual cells. The number of vessels is at this stage less than normal.

The two forms of endometritis just described often occur together. Thus in specimens of glandular endometritis parts may be found which show the appearances characteristic of interstitial endometritis in the formative stage. The most extensive thickening of the endometrium which is clinically met with is due to this mixed form, and this fact led to the name of 'fungous' endometritis, being given to it by Olshausen. In such cases small polypoidal elevations, having the same structure as the thickened mucosa, are often formed upon the surface of the endometrium, and the condition is accordingly sometimes called 'polypoid' endometritis. It should, however, be recollected that both these pseudo-varieties are in reality examples of a mixed form of glandular and interstitial endometritis.

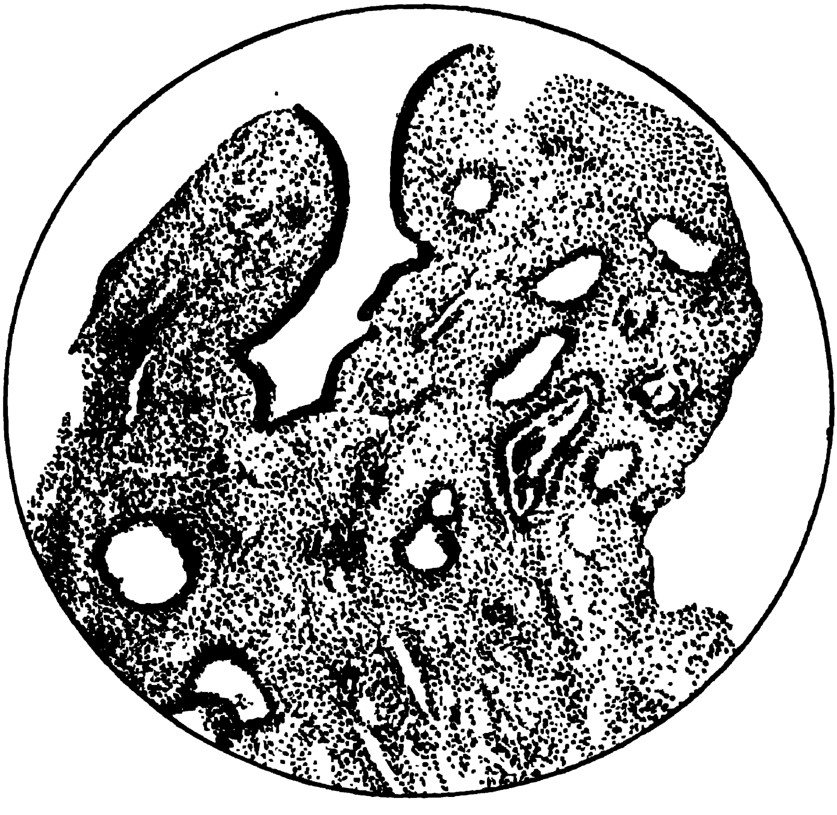

FIG. 91.—CHRONIC ENDOMETRITIS, INTERSTITIAL FORM. The section is taken through one of the polypoid processes of the endometrium. The glands are comparatively few and their epithelium is atrophied.

**Cervical Endometritis.**—The mucous membrane of the cervix is probably always involved when endometritis of the body of the uterus is present. Since the cervix is accessible to direct examination, the changes produced can be more closely described than in the case of the uterine body.

Cervical endometritis gives rise to changes in the character of the cervical secretion, and in the appearance of the lips of the os externum. In slight cases the cervical secretion is excessive but retains its general characters, except that it is less viscid than the normal in consistence. Usually, however, from being colourless and transparent it becomes yellowish-brown and turbid.

The changes in the lips of the os differ in nulliparae and multiparae. In a nullipara a bright red patch is formed which may completely surround the os or may be confined to one or other lip; its edge is irregular and it differs from the surrounding vaginal mucous membrane in being dull instead of polished, bright red instead of pale, and in many cases slightly irregular or worm-eaten instead of smooth upon its surface. It is flush with the general surface, and its edges are neither thickened nor undermined; in these points it differs from an ulcer. On being gently scraped with the finger-nail it may bleed slightly, but its tissues are not friable. The condition thus described has been known for long by the name of 'cervical erosion.'

In a multipara the same changes may be met with, but the appearances are often modified by the results of obstetric injury. When bilateral laceration has occurred, a change often results which is known as *cervical ectropion*. This injury deeply divides the vaginal portion of the cervix into an anterior and a posterior lip; each lip tends by contraction of the fibrous tissue it contains to become rolled outwards, shortening the vaginal surface and lengthening the cervical surface, so that the latter lies exposed in the vaginal canal. The cervical endometrium thus laid bare loses its normal characters and assumes those of 'erosion,' and this change may spread widely over the whole of the exposed cervical surfaces. This combination of ectropion and 'erosion' completely alters the appearance of the cervix as seen through the speculum, but by seizing the tips of the everted cervical lips with tenaculum forceps, the ectropion can be corrected, the separated lips rolled together and the cervix restored approximately to its normal appearance.

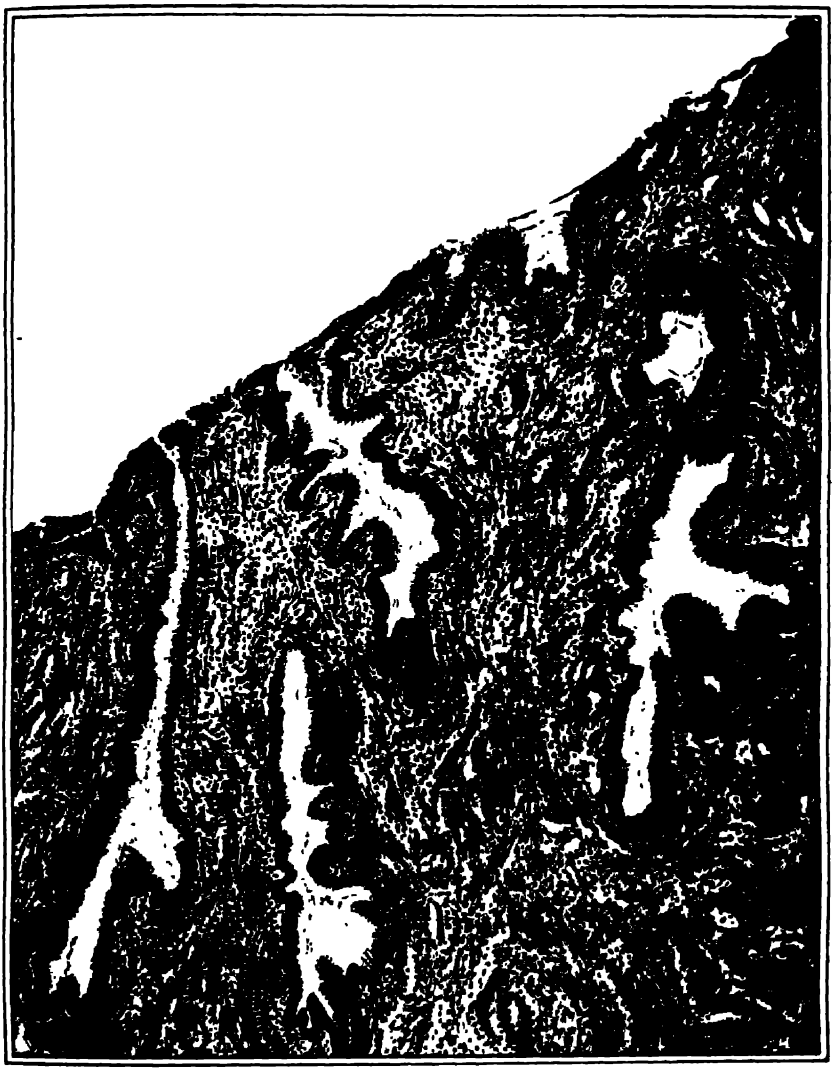

FIG. 92.—CERVICAL EROSION. Vertical section through a patch showing (1) the dilated glands opening on the surface, (2) the partial loss of the surface epithelium, (3) the large number of vessels in the stroma.

There is no change in the squamous-celled epithelial covering of the outer wall of the cervix.

*Microscopic Appearances.*—The changes in cervical endometritis correspond with those found in glandular endometritis of the body; further, the same doubt exists as to their being in reality of inflammatory origin and as to their actual pathological significance. The abundant secretion is the result of unusual glandular activity, and the change called cervical 'erosion' has a similar origin. If a section of a patch of 'erosion' is examined it will be seen—(1) that it has no covering of stratified squamous epithelium, like that of the general surface of the vaginal cervix; (2) that large compound glands lined with columnar epithelium open upon its surface; (3) that except in the neighbourhood of the mouths of these glands the epithelial covering is lost; (4) that the stroma is very vascular and highly cellular (fig. 92). The deep portions of the glands often become dilated, forming small retention cysts large enough to protrude upon the surface; this form is sometimes called a *cystic erosion*. In some cases the surface is divided by sulci into irregular elevations somewhat resembling papillae, and this variety is sometimes called the *papillary erosion*; it corresponds with those cases observed clinically to be irregular and worm-eaten in appearance. Not infrequently small mucous polypi are found growing upon a cervical 'erosion.'

These appearances indicate that the normal squamous epithelial covering of the vaginal cervix has been replaced by mucous membrane of a different type, corresponding generally with the cervical endometrium.

The essential change in this condition is therefore to be found in abnormal activity of the columnar epithelium, leading to an encroachment upon the areas properly covered by the squamous epithelium. The name 'erosion' is accordingly incorrect, but the older clinical observers who first studied this condition wrongly regarded it as ulceration with loss of tissue, and the name 'erosion' was the outcome of this view. We owe our accurate knowledge of its histology to Ruge and Veit (1878), but the original name, as in so many other cases, survives the demonstration of its inaccuracy. The name of 'catarrhal patches' has been suggested by Barbour, and this is undoubtedly more accurate. When ectropion is present, a good deal of the 'catarrhal patch' is not an encroachment, but an exposure of the cervical endometrium proper, which, however, is abnormally thickened, and from exposure has lost much of its surface epithelium.

Although glandular proliferation is the most marked change, 'erosions' also show proliferation of the subepithelial connective tissue stroma, round-celled infiltration and increased vascularity.

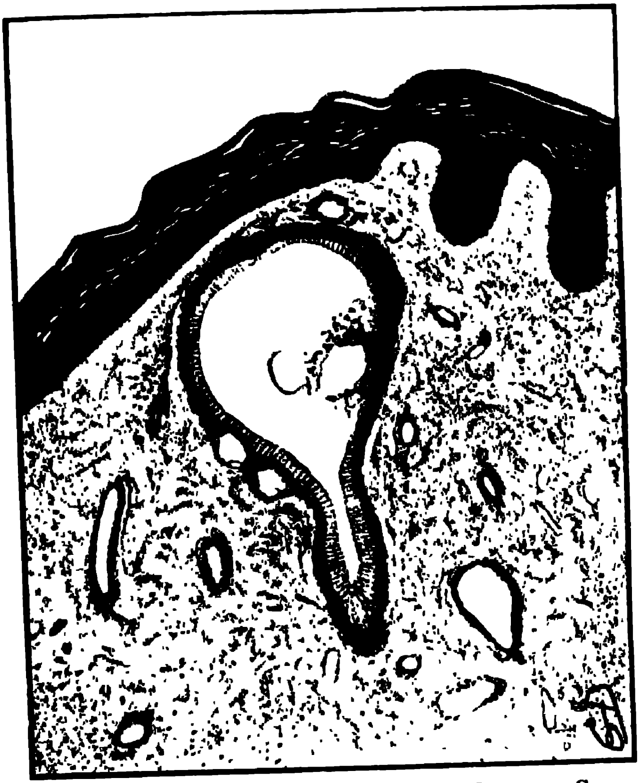

FIG. 93.—VERTICAL SECTION THROUGH THE VAGINAL SURFACE OF THE CERVIX, showing (1) the intact layer of squamous epithelium; (2) a large dilated gland beneath it, lined with high columnar cells. The gland has pushed its way outwards from the cervical endometrium.

The manner in which these 'erosions' or catarrhal patches are produced is shown in figs. 93–95. In fig. 93 is seen the vaginal surface of the cervix with its covering of stratified epithelium intact; beneath the epithelium is a dilated cervical gland which has penetrated deeply from the cervical endometrium, and is separated from the vaginal epithelium only by a thin layer of fibrous tissue. Glands in this condition give rise to the small nodules often found projecting upon the surface of the cervix, and which are known as the 'ovula Nabothi.' It will be observed that the gland is lined throughout with the high columnar epithelium characteristic of the cervical endometrium. In fig. 94, taken from the same section, another dilated gland is shown which has pushed out a small process into the layer of stratified epithelium, penetrating this layer for more than half its depth. It will also be observed that while in the deeper parts of the gland the epithelium has preserved its normal characters, as the squamous-celled layers are approached the cells become gradually lower, until they are no more than cubical, and where the glandular space is actually bounded by the

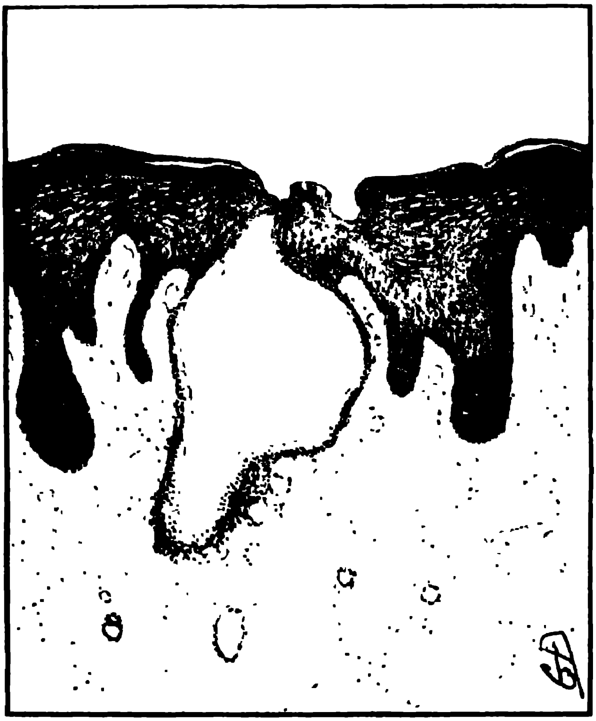

FIG. 94.—SECTION FROM THE SAME CERVIX AS FIG. 93, showing a dilated gland encroaching upon the squamous epithelium; the gland has lost its columnar cells where it is in contact with the squamous epithelium.

squamous epithelium, the epithelial lining has disappeared altogether. In fig. 95, which is taken from a third gland in the same section, the acinus has opened upon the squamous epithelial surface by a comparatively wide mouth. The glandular epithelium has now advanced for a short distance upon the squamous-celled portion of its wall, but stops a long way short of the surface.

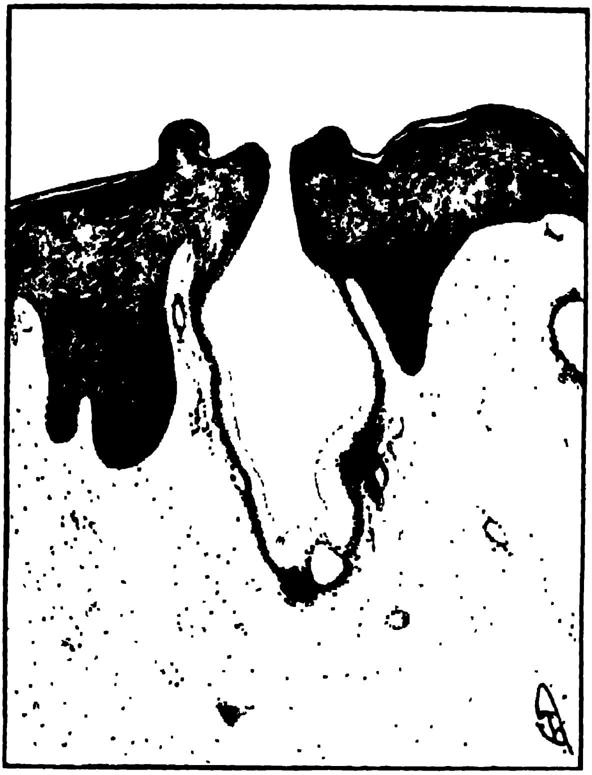

FIG. 95.—SECTION FROM THE SAME CERVIX AS FIGS. 93 AND 94, showing the gland has opened through the squamous-celled covering upon the outer surface of the cervix.

It therefore appears that an 'erosion' or catarrhal patch is formed by penetration of the squamous epithelium by subjacent cervical glands; after these have opened upon the surface, the intermediate areas of squamous cells disappear, and the columnar epithelium of the glands grows out upon the exposed surface, but not to the extent of affording it a complete covering.

***Symptoms and Treatment of Chronic Endometritis.***—*Inasmuch as there is considerable doubt whether all the conditions* described above as 'endometritis' are in reality pathological, the clinical features cannot be described with accuracy. It is, however, certain that the alterations of the endometrium which have been included under the name of 'chronic endometritis,' though of frequent occurrence, are of small clinical importance. The only symptoms to which they give rise are menorrhagia and leucorrhœa; frequently these symptoms are associated with general ill-health and various neuroses which, however, cannot be rightly attributed to the condition of the uterus. The severity of the direct symptoms varies. When chronic endometritis is the only lesion present, menorrhagia of moderate severity is common; it is, however, rare to meet with profuse hæmorrhage, although occasionally notable exceptions occur in which profuse and irregular losses of blood form a prominent symptom. Chronic endometritis of the glandular type is constantly met with when the uterus contains submucous or interstitial fibroids (see fig. 108), and also when mucous polypi are present. In such circumstances also profuse menstruation and irregular hæmorrhage often occur. The leucorrhœa is usually of the muco-purulent type; when cervical endometritis is present the discharge presents the viscid characters usually associated with the cervical secretion. Endometritis, whether corporeal or cervical, does not cause either menstrual or other pain, but in the infective varieties the constant presence of irritating discharges in the vagina may set up a chronic vulvo-vaginitis. Further, the infective forms of chronic endometritis almost always prevent conception, but the non-infective forms appear to have a much less decided influence in this direction.

*Cervical* endometritis gives rise in many cases to discharge and backache. The discharge is of the characteristic viscid nature; sometimes it is colourless and often its resemblance to the white of egg is pointed out by the patient herself; in other cases it is turbid, and more or less deeply yellow from admixture with muco-pus. In the infective forms the vaginal surface of the cervix and the walls of the vaginal fornices show evidences of inflammation, in redness and loss of polish. In the non-infective forms the only visible changes are catarrhal patches or 'erosions,' associated it may be *with ectropion, and in almost all cases with a patulous condition of the external os. Backache is a symptom so* common that its association with cervical endometritis does not necessarily imply a causal relation. Extensive 'erosions,' and severe degrees of the infective forms of cervical endometritis, however, almost always give rise to pain of this character, which is aggravated by exertion.

The infective forms of cervical endometritis constitute an almost absolute impediment to conception.

The *diagnosis* of corporeal endometritis is made from the association of the above-mentioned symptoms with enlargement of the body of the uterus as determined by the bimanual examination, and lengthening and dilatation of the uterine cavity as determined by the use of the sound. Cervical endometritis may be recognised by simple inspection of the cervix through a speculum, when the special characters of the discharge, as seen at the external os, and the presence of patches of 'erosion,' will at once make the diagnosis clear. A patch of erosion may, by an inexperienced observer, be mistaken for an early stage of carcinoma of the cervix, but the differential diagnosis of these conditions will be mentioned in connection with the latter (p. 288). The condition of the adnexa should always be carefully noted in cases of endometritis; if signs of inflammatory thickening of these parts are detected, the probability of an infective cause must be borne in mind.

*Treatment.*—Not every case in which the signs and symptoms of chronic endometritis are present requires treatment. In women who have borne several children many of the local conditions described are very commonly met with and are quite compatible with good health. When occurring in a nullipara they are of greater moment and are usually associated with ill-health. If the symptoms of endometritis are slight and the general ill-health is marked, the latter alone should be treated; a course of tonics with judicious regulation of diet, exercise, etc., usually relieves all the symptoms. Menorrhagia of moderate severity may be kept under control by the use of ergot or styptol during the periods, as described on p. 112. Leucorrhœal discharge is usually treated by douching; this measure is not curative, but by cleansing the passages relieves a good deal of the discomfort caused by the discharge.

*Medical treatment of this kind may be supplemented by* a course of the waters and baths of Woodhall Spa or of Ems, repeated in spring and autumn as may be necessary. Such general disorders as anæmia, gout or rheumatism also require treatment when present.

Severe or obstinate cases should be treated by curetting. There are two conditions which may be regarded as special indications for this operation, viz. severe bleeding whether menstrual or irregular, and the presence of signs of chronic non-suppurative inflammation in other pelvic structures. In the former case the removal of the thickened endometrium arrests the hæmorrhage; in the latter the endometrium is probably infected, and the infective foci in the uterus may be a constant source of re-infection of the deeper parts. Curetting for leucorrhœa and for the symptoms described as indirect is seldom successful, and is not to be advised.

Cervical 'erosions' are best treated by freely cauterising the parts under anæsthesia with the actual cautery, at a dull red heat. The tissues must be destroyed to a depth of a quarter to a third of an inch, and the burning may have to be repeated before a completely successful result is obtained. In cases associated with well-marked ectropion the patches of erosion may be excised and the cervix repaired by the operation of trachelorrhaphy. When 'erosions' and mucous polypi are present on the cervix, curetting is indicated in addition to the direct treatment of these conditions, for corporeal endometritis usually accompanies them.

## SUBINVOLUTION AND RETENTION OF PRODUCTS OF CONCEPTION

Following upon a confinement or a miscarriage an enlarged condition of the uterus is often met with to which the name 'subinvolution' has been applied. The name connotes the view that the enlargement results from arrest or insufficiency of the process of involution which normally follows the termination of pregnancy. While the frequent occurrence of uterine enlargement in these circumstances is undoubted, its causation is not so simple as the name given to it implies. In the great majority of cases a mild form of uterine infection appears to be the essential causal factor, and associated with this are frequently to be found evidences of some portions of the embryonic membranes or of the maternal decidua having retained their attachment to the uterine wall. A mild form of septic endometritis is therefore usually present, and it may be that, as a result of this, the normal processes of involution are impeded, and the old name may thus represent a contributory factor in the condition. 'Subinvolution' is frequently complicated by backward displacement of the uterus, and sometimes by evidences of the infection having spread from the uterus to the tubes and the pelvic peritoneum.

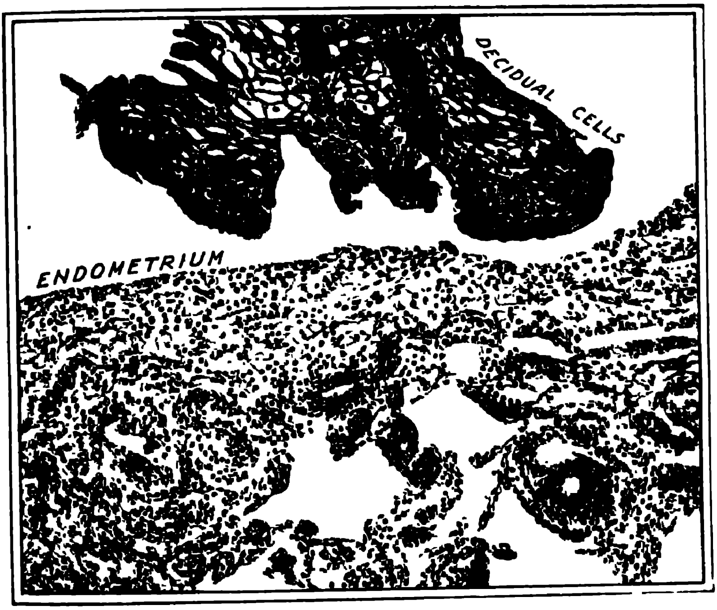

FIG. 96.—SCRAPING FROM THE UTERUS IN A CASE OF SUBINVOLUTION. A fragment of decidual tissue is seen upon the surface of the endometrium.

*Symptoms and Diagnosis.*—Subinvolution of itself gives rise to much the same symptoms as those of chronic endometritis just described. Its close association with a recent pregnancy usually suggests its true nature. When complicated with retention of products of conception, more severe hæmorrhage is met with; usually the bleeding is irregular, sometimes nearly constant, and often profuse. When associated with backward displacement, pain in the back and 'bearing down' pain become prominent symptoms. On exploring the uterine cavity with the finger after the cervix has been dilated, adherent portions of placenta or membrane large enough to be felt may be encountered; sometimes the retained portions are of microscopic size and can only be found by histological examination of the fragments. Atrophied chorionic villi and patches of degenerated decidual cells are the structures most frequently met with (fig. 96).

The *treatment* consists in curetting the uterus, after first exploring the whole cavity carefully with the finger, in order that small fragments may be located and so may not be missed by the curette.

## EXFOLIATIVE ENDOMETRITIS

This condition is entirely different in its clinical features and in its pathology from the forms of endometritis which have previously been considered. Its outstanding characteristic is that pieces of membrane become separated and expelled from the uterus, usually during a menstrual period, sometimes independently of menstruation. Sometimes portions of membrane are thus thrown off regularly during every menstrual period, and to this condition the clinical name of 'membranous dysmenorrhœa' has been applied since Morgagni first recognised it (1723). From a pathological standpoint it may more appropriately be described as *chronic exfoliative endometritis.* Under entirely different circumstances an *acute* form is sometimes met with; in the acute exanthemata and in septicæmia, the separation and expulsion of large portions of membrane from the uterus have been occasionally recorded. Considerable bleeding always accompanies the expulsion of the membrane, and sometimes this is profuse. When pieces are discharged during menstruation, considerable pain is usually present, but this is not invariably the case.

The membrane is usually discharged in narrow strips which may escape observation from being concealed by the blood which accompanies them. They may be expelled rolled up into a very small size, but when floated out in water display a length of two to three inches. Occasionally a complete *cast* of the uterus is met with in the form of a triangular bag; the base line corresponds to the fundus, and ends at each side in a tapering angle indicating the position of

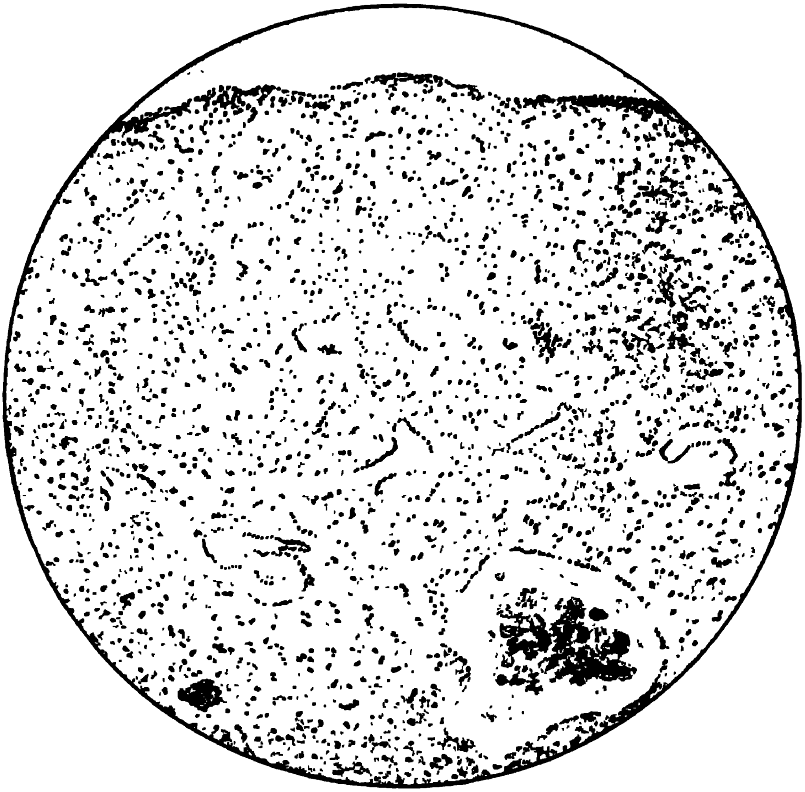

FIG. 97.—VERTICAL SECTION THROUGH MEMBRANE DISCHARGED IN A CASE OF CHRONIC EXFOLIATIVE ENDOMETRITIS. Several imperfect glands are seen in the section (Cuthbert Lockyer).

the opening of the Fallopian tube. In most cases the apex is truncated and corresponds to the level of the internal os. Occasionally a cast is expelled in two portions, representing the anterior and posterior walls respectively.

The naked eye and microscopic characters of the membrane discharged in these cases are fairly uniform. It is thin and semi-translucent, pale in colour, smooth on its inner and shaggy upon its outer side. It is in fact thinner than the normal endometrium, and very much thinner than the decidua. Microscopically it usually consists for the most part of connective tissue of embryonic type with interstitial hæmorrhages; in parts it may be thickened by the presence of adherent layers of stratified blood clot on the surface. Among the connective tissue elements are sometimes found large stellate cells, and patches of round cell infiltration.

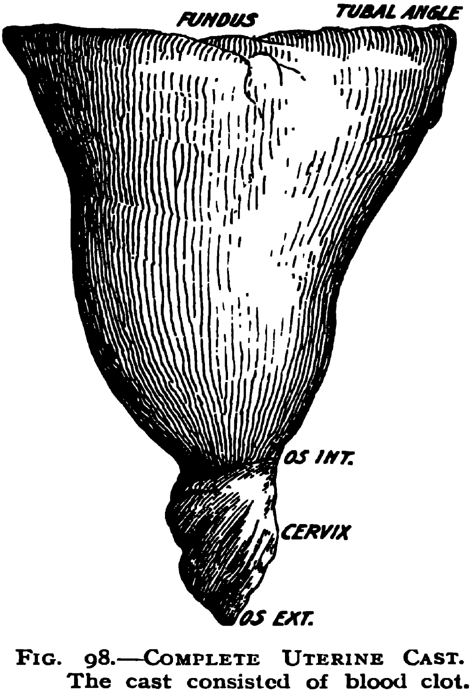

FIG. 98.—COMPLETE UTERINE CAST.
The cast consisted of blood clot.
Case of tonsillar septicæmia.

The large polygonal cells characteristic of the decidua are not present. Occasionally traces of the columnar epithelial covering of the endometrium remain, and in rare instances small gland tubules may be found (fig. 97). Sometimes the strips of membrane prove to consist solely of stratified layers of partly organised blood clot.

The *acute* form of exfoliative endometritis is due to necrosis of the endometrium resulting in some manner from the toxic condition of the blood associated with systemic infection. The pathology of the chronic form is obscure; it is generally unconnected with local infection, or with any other evidence of disease in the uterus or its adnexa.

*Treatment* is not indicated in the acute form, inasmuch as the systemic infection completely overshadows it in importance. The chronic form is practically incurable; repeated curettings and prolonged intra-uterine medication alike fail, as a rule, to arrest the process.

**Uterine Casts.**—Casts of the uterine cavity of three distinct kinds are known to occur. The most complete and well-formed examples are the *decidual casts* found in extra-uterine gestation, which will be described on page 469. Others of rarer occurrence are due to the process of *exfoliative* endometritis just described. Rarest of all are the *blood casts*, an example of which is shown in fig. 98. This cast forms a complete mould of the cavity of the uterus, from the fundus to the external os; its lower end consists of a conical portion about an inch in length, which is separated from the body of the cast by a shallow sulcus corresponding to the position of the os internum. The specimen shown in the figure consisted of a solid mass of coagulated blood, and was passed from the uterus by a woman who died from acute septicæmia of tonsillar origin.

## SENILE ENDOMETRITIS

This name is applied to a form of endometritis which occurs in elderly women who have passed the menopause, and is not usually met with until several years after this event. It is probably due in part to the atrophic processes which usually affect the endometrium at this period of life, and partly to the results of infection ascending from the vagina. The special liability of the vagina to infection at this time has been already referred to (p. 81). The condition is accordingly usually associated with senile vaginitis.

The *symptoms* met with are hæmorrhage, which is never severe, and discharge which is purulent and sometimes offensive. The endometrium shows true inflammatory changes with more or less extensive suppuration and destruction of the epithelial covering. The uterus is usually small, and its walls thin (fig. 99) and atrophied.

From suppuration and destruction of the mucosa two results may ensue: (1) pyometra; (2) stenosis of the cervix. *Pyometra* consists in distension of the uterine cavity with pus; it is a very rare complication of endometritis, but may ensue in the course of certain other diseases (see p. 320). The accumulation of the pus in the uterus is usually due to *stenosis*, which results from fusion of the partly denuded lips of the os or walls of the cervix. Occasionally a degree of pyometra may result from senile endometritis with retroflexion without stenosis of the cervix having taken place. The displacement of the uterine body prevents drainage through the cervix, and the atrophy of the uterine muscle so weakens the wall, that the accumulating fluid cannot be got rid of by contractions. This was the cause of the pyometra in the specimen shown in fig. 99.

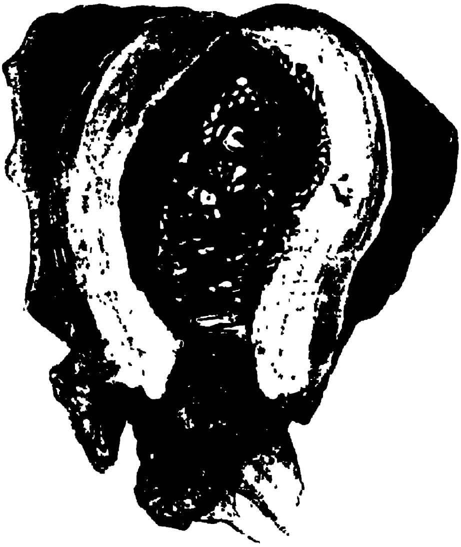

FIG. 99.—SENILE ENDOMETRITIS AND PYOMETRA. Uterus removed by vaginal hysterectomy. Multipara, aged 63. The endometrium is replaced by granulation tissue.

The differential diagnosis of senile endometritis, from carcinoma of the uterine body, a disease prone to occur at about the same period of life, will be discussed on p. 301.

The *treatment* consists, in the first place, in curetting and thorough disinfection of the uterine cavity; after the operation has been recovered from, application of a strong antiseptic fluid such as pure carbolic acid or iodised phenol should be made to the walls of the uterus once or twice a week, or relapse will probably occur. If a cure cannot be effected by these means, the uterus should be removed by the vaginal route (vaginal hysterectomy).

## CHRONIC METRITIS: FIBROSIS UTERI

Under these terms are included groups of cases, the clinical features of which are definite and uniform, but the pathology of which is obscure. It will be most convenient in this instance to consider the clinical features first and the pathology afterwards.

**Clinical Features.**—The prominent symptom met with in all cases is uncontrollable bleeding during menstruation; the loss of blood is profuse and prolonged, and is in almost all cases attended with very little pain. The change from the menstrual type normal to the individual is gradual and progressive, and may at first consist in prolongation of the period or shortening of the interval. 2 The bleeding is uninfluenced by rest, by drugs, or by hot douching. In a small proportion of cases irregular intermenstrual hæmorrhages also occur, but the type of bleeding especially characteristic of the condition is menorrhagia. In many cases the patient has no other symptoms of pelvic disease; but sometimes backward displacement of the uterus is also present, and sometimes there are inflammatory changes in the tubes and ovaries, when symptoms due to these complications will also be met with.

The condition is peculiarly liable to affect parous women, and falls almost exclusively upon the period of thirty-five to fifty years of age, although a few exceptions beyond either of these limits have been recorded. The degree of fertility met with is less than the average, and in many cases a prolonged interval occurs between the last pregnancy and the onset of the hæmorrhage.

3 On local examination enlargement of the body of the uterus is almost invariably recognisable, and usually the consistence of the organ is abnormally hard and dense. 4 Backward displacement is often present; and sometimes

adhesions involving the uterus itself or the tubes and ovaries.

The general condition shows mainly the results of chronic anæmia. In a certain number of cases, cardiac valvular disease or chronic nephritis has been found associated with it; these conditions respectively tend to produce congestion of the abdominal and pelvic viscera generally, and arterial degeneration, and thus may be factors contributory to the hæmorrhage.

**Pathology.**—Conflicting views have been expressed by different authors who have given attention to these cases, and the truth appears to be that two, or possibly three, different types may be met with. Many of the opinions expressed upon the subject are of little value because allowance has not been made for the natural histological changes which occur in the uterus as a consequence of child-bearing and of the climacteric (see p. 27).

The gross changes observed in the uterus are increased thickening of the uterine wall, and usually increased density of its tissues, with sometimes coincident enlargement of the uterine cavity. The endometrium is not, as a rule, thicker than normal, so that the increase is in the fibro-muscular layers.

On histological examination it is clear that the changes observed can be arranged into three groups, not all of which are necessarily seen in the same uterus, but which possibly represent different stages of the same process: (1) areas of round cell infiltration, most marked in the layers immediately underlying the endometrium; when this change is well marked the case is usually described as one of 'chronic metritis'; (2) a general increase, either absolute or relative, in the amount of fibrous and elastic tissue in the myometrium; (3) areas of degeneration, of the nature of hyaline degeneration, most marked in zones surrounding the larger vessels, but also present in the fibrous tissues between the muscle bundles. Cases in which changes (2) and (3) are found are generally described as 'fibrosis uteri.' Thickening of the coats of the vessels, in some cases affecting the adventitia and media, in others mainly the intima, have also been described, but in the case of parous women such changes are not necessarily pathological.

The questions which remain unsettled are: (*a*) Are all of the above changes the results of a slowly progressive chronic inflammatory process attacking the myometrium? (*b*) If so, is the inflammatory process infective or non-infective? (*c*) Are changes (2) and (3) inflammatory or degenerative in their nature?

It may be added that the clinical evidence strongly favours the view that the etiological factor common to all cases is infection demonstrable either in the uterus itself or in other pelvic organs.

Although the etiology of these changes is unsettled, the manner in which they occasion hæmorrhage is fairly clear. Inflammatory changes naturally exaggerate the congestion of the uterus which is produced by the menstrual process, and so increase the loss of blood. Excess of fibrous tissue in the uterine wall produces a certain deficiency in the power of muscular contraction, which is an important factor in controlling menstrual hæmorrhage (p. 75) under normal and abnormal conditions. The combined effect of increased congestion and diminished contractility will be to allow an almost indefinite increase in the amount of blood lost through the uterus. And probably, either factor acting alone will suffice to cause menorrhagia of a clinically severe type.

**Clinical diagnosis** can only be established by prolonged observation of the effect of treatment; when the usual medicinal measures employed to control menorrhagia fail after adequate trial, and curetting reveals the absence of malignant disease or of considerable thickening of the endometrium, the diagnosis of 'chronic metritis' or 'fibrosis' is justified.

**Treatment.**—It has been mentioned already that drugs fail entirely to control the bleeding. Curetting is also practically useless, and in some cases appears to have been followed by positive increase in the severity of the hæmorrhage. Atmokausis has met with success in the hands of certain observers, but the serious objections to this procedure have been already mentioned (p. 115). The remaining expedient is to remove the uterus, the ovaries being conserved if healthy. This operation, however, must not be resorted to until it is clear that the hæmorrhage cannot be controlled by other means, and that the patient's health is suffering from its effects.

## UTERINE TUMOURS

FIBROID TUMOURS
POLPYI
CANCER OF CERVIX
CANCER OF BODY
SARCOMA
CHORION-EPITHELIOMA

## FIBROID TUMOURS OF THE UTERUS

### GENERAL PATHOLOGICAL ANATOMY

These tumours occur in great diversity of size, shape, and distribution; they are subject to a variety of secondary changes, and frequently induce secondary changes in neighbouring organs; their description must necessarily be somewhat lengthy.

Fibroids may develop in any part of the uterus, but are much commoner in the body than in the cervix. In rare cases they arise also in the round ligament. They are almost invariably multiple, probably not more than one to two per cent. occurring as single tumours. They may, under certain conditions, attain enormous size, and all gradations may be met with down to small growths of the size of a split pea or a millet seed. They may symmetrically 4 enlarge the organ in which they grow, or they may distort its shape, or, being attached to the uterus only by a pedicle, they may attain a large size without producing any con- 5 siderable alteration in the bulk or shape of the parent organ. When multiple, one growth frequently attains a size predominant over the others; the number to be found in a single uterus is, as a rule, comparatively small, but occasionally enormous numbers of small growths are met with, none of which attains considerable size.

6 Fibroid tumours are solid growths arising in the muscular tissue of the uterine wall. In the early stages they are invariably 7 enclosed within a well-formed capsule, from which they receive their blood-supply; their vessels therefore enter at the periphery, and the central parts of these tumours

are less vascular than the peripheral parts. As they increase in size they may either grow outwards beneath the peritoneum or inwards beneath the mucosa, or they may remain surrounded by a definite layer of uterine

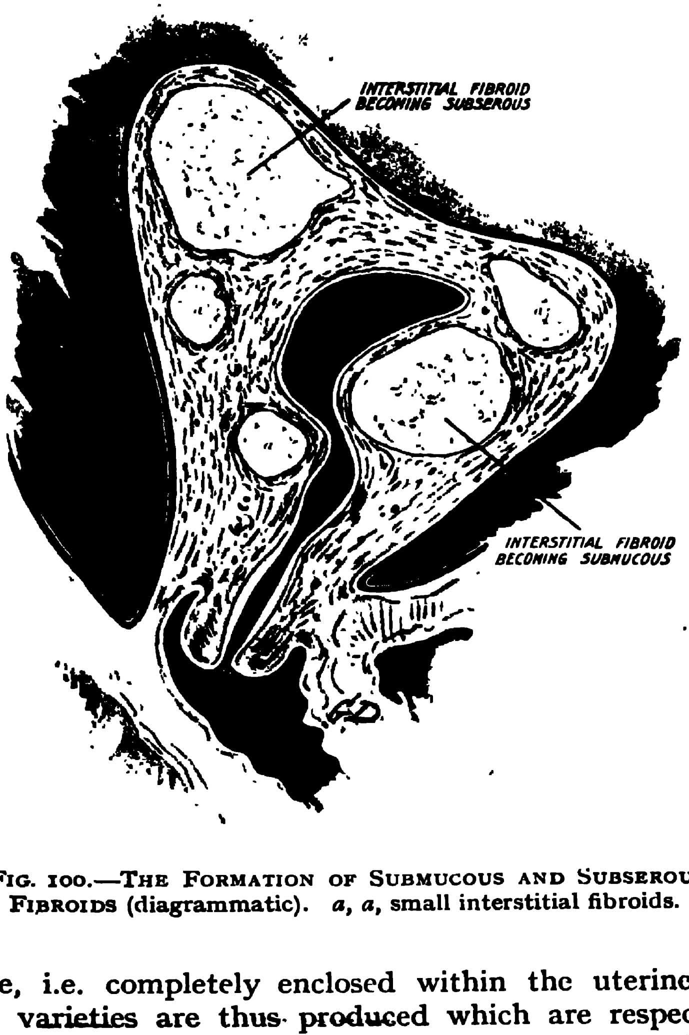
INTERSTITIAL FIBROID BECOMING SUBSEROUS
a
a
INTERSTITIAL FIBROID BECOMING SUBMUCOUS

FIG. 100.—THE FORMATION OF SUBMUCOUS AND SUBSEROUS FIBROIDS (diagrammatic). *a*, *a*, small interstitial fibroids.

muscle, i.e. completely enclosed within the uterine wall. Three varieties are thus produced which are respectively called *subperitoneal*, *submucous*, and *interstitial* fibroids. It will be understood that the great majority of fibroids are at first interstitial; the greater number are small, but such tumours may attain a size sufficient to distort the uterus, and protrude upon the mucous or peritoneal surface; being enclosed within their capsule and surrounded outside this with a complete zone of muscular tissue, they are, however, still interstitial (fig. 100). As they grow they may pass outwards, being, as it were, extruded from the muscular wall so as to reach and displace the peritoneal coat; or they may pass in the same manner inwards into the cavity, raising the mucous membrane. As a result of this process the tumour escapes from its capsule, so that the greater part is covered only by peritoneum or endometrium. Both subperitoneal and submucous fibroids may retain a sessile attachment to the uterine wall, or may become polypoid by the formation of a distinct pedicle, which sometimes attains the length of two to three inches (fig. 101). In the case of sessile tumours, a portion of the capsule at the base usually persists, allowing the tumour to be readily shelled out of the uterine wall.

Fibroid tumours vary greatly in consistence; the great majority are hard and inelastic in texture; some are of wooden or almost stony hardness; others are soft, and some are cystic. It is probable that all fibroids are originally hard, softening being almost invariably due to degenerative changes; softness, however, in rare cases results from extreme vascularity. On section their colour is usually paler than that of the cut uterine wall; those which are moderately hard show upon their cut surface a whorled arrangement of curved, interlacing fibres, which has been aptly likened to a ball of rolled worsted. The softer growths do not show this appearance. The capsule consists, like the muscular wall of the uterus, very largely of muscle fibres; when divided it retracts along with the uterine wall, and tends to extrude the tumour from its bed. If an interstitial fibroid is hemisected *in situ* after operative removal of the uterus, this phenomenon will usually be observed slowly to take place. A minor result of this process is to make the cut section of the tumour not flat, but slightly convex.

*Microscopic Appearances.*—Fibroid tumours consist of plain muscle and white fibrous tissue in varying proportions. In a few cases the tumour consists entirely of muscle fibres, and these may correctly be termed *myomata*; usually there is a considerable proportion of fibrous tissue, and accordingly the name *fibro-myoma* or '*fibroid*' may be correctly applied to the whole class. The nuclei of plain muscle are short, thick, straight, or slightly curved rods with rounded extremities; the nuclei of fibrous tissue are spindle-shaped, and curved, and are both longer and more delicate than the muscle nuclei (fig. 103). When seen in cross-section it is not easy to distinguish connective tissue from muscle fibres except by the differential stain of van Gieson, by which muscle is stained yellow and fibrous tissue pink. The intermingled muscle and connective tissue fibres are arranged in small bundles which interlace in curves of varying direction, thus producing the whorled arrangement shown in fig. 102, and

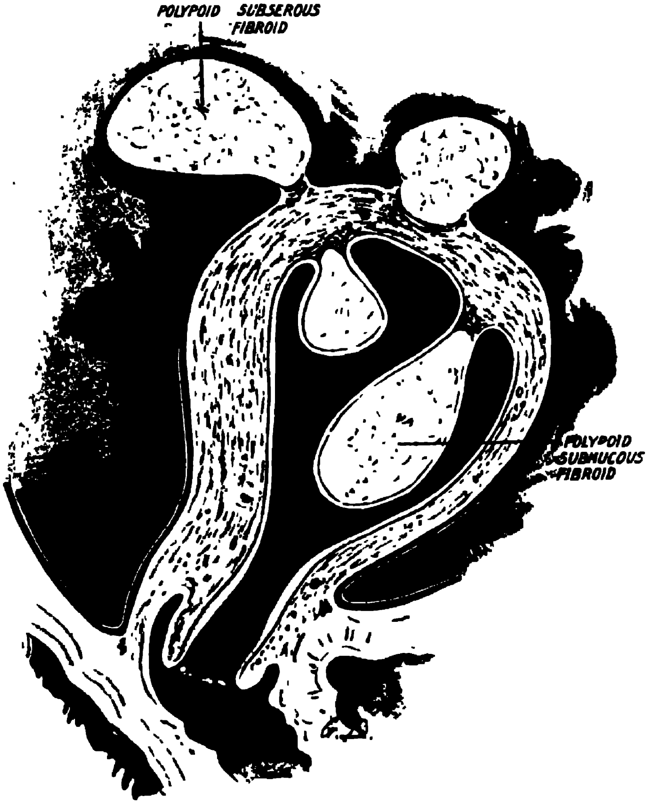

FIG. 101.—THE FORMATION OF POLYPOID FIBROIDS (diagrammatic). The growths *a*, *a*, still retain a sessile attachment to the uterine wall; the other two have been completely pushed out of the muscular layer.

often observable with the naked eye. In a hard fibroid the number of vessels seen under a low magnification, in a

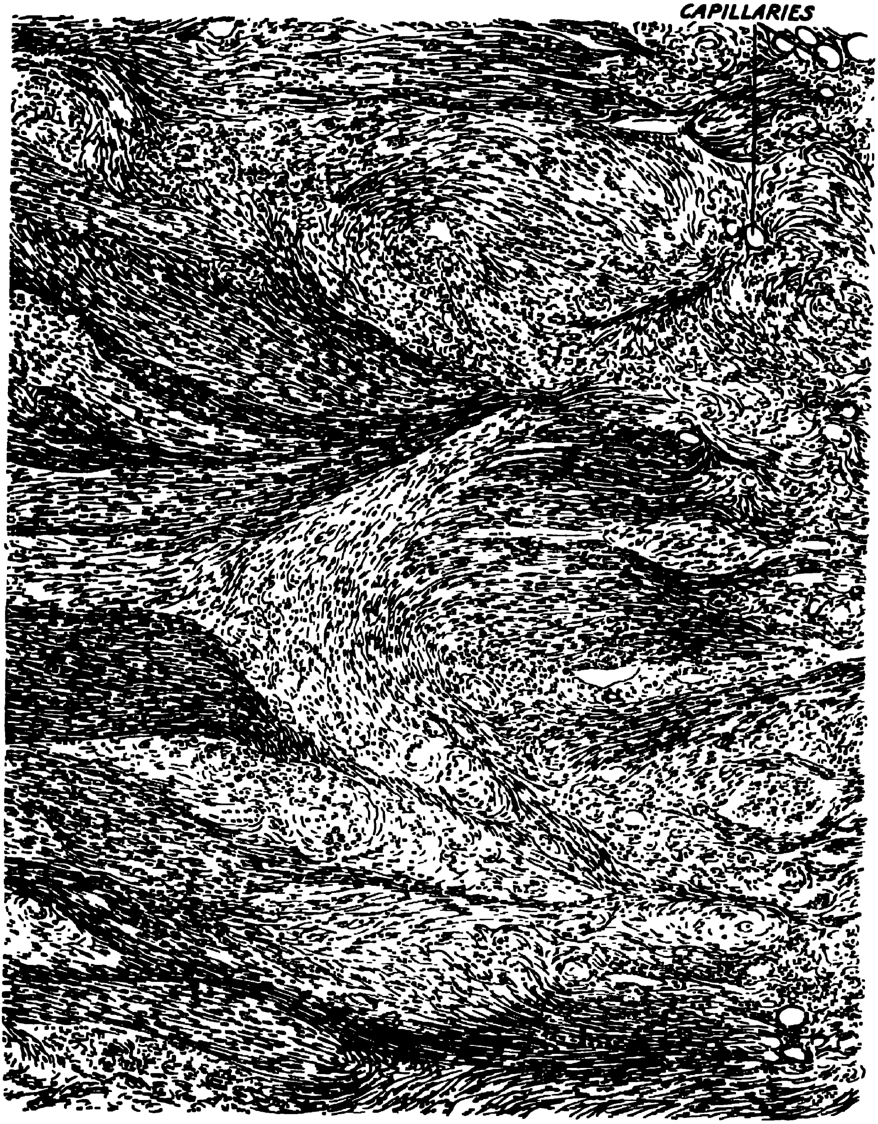

FIG. 102.—A SECTION OF A HARD FIBROID TUMOUR (low power). The arrangement of the interlacing bundles of fibres is well shown.

single field of the microscope, is very small; the majority are of the capillary type, but large vessels with thick walls can

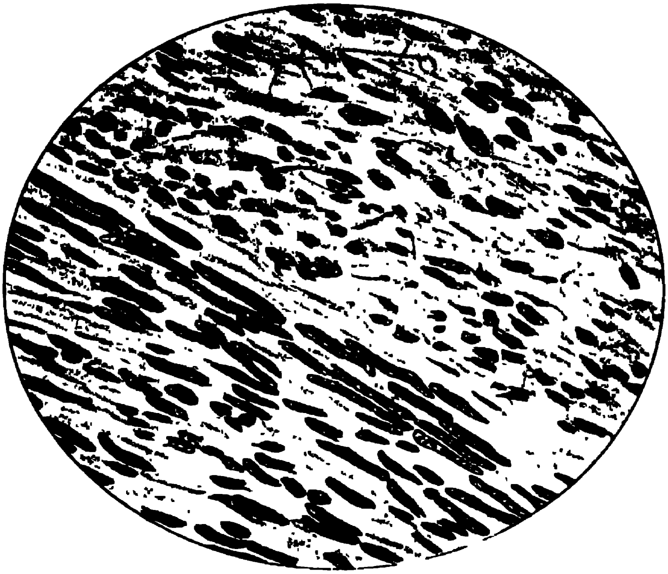

FIG. 103.—THE ELEMENTS OF A FIBROID TUMOUR (high power). In the lower half of the figure are seen bundles of the rod-shaped nuclei of plain muscle arranged in parallel planes. Above are seen the spindle-shaped and stellate nuclei of connective tissue.

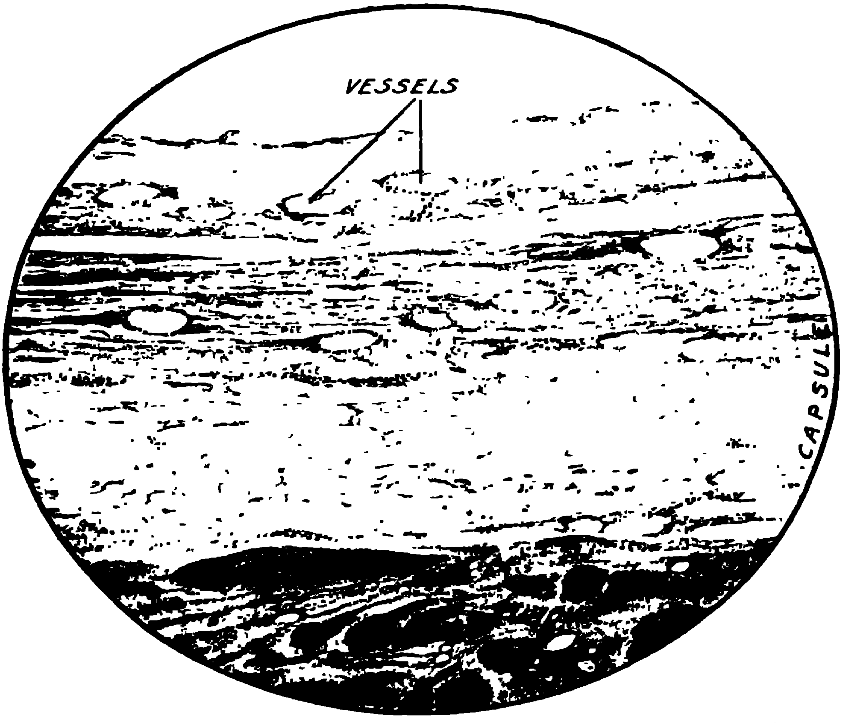

FIG. 104.—CAPSULE OF A FIBROID TUMOUR (low power).

also be found. Some fibroid tumours are, however, of softer consistence and much more vascular than this, showing very large numbers of well-formed arteries in the microscopic field. Occasionally the degree of vascularity is extreme, the tumour being permeated with blood-vessels and blood sinuses; to these the name *telangiectatic fibroid* was applied by Virchow. These soft vascular growths may belong to either of the three varieties just described and are often non-capsulated. The capsule of a fibroid tumour differs from the tumour tissue chiefly in two points: (1) it is of much looser texture, and is composed in the main of parallel bundles of fibres; (2) it contains large numbers of vessels, some being arteries, the majority capillaries and veins (fig. 104).

In a small number of fibroid tumours, gland tubules may be found, on a careful microscopic search, surrounded by a zone of highly cellular tissue, which closely resemble the glands of the endometrium (fig. 115). All such tumours are to be regarded, not as ordinary fibroids, but as *adenomyomata*, and these will be considered in a later section (p. 237).

It will now be necessary to describe in more detail the characters of the three varieties of fibroid tumour.

**Subperitoneal (Subserous) Fibroids.**—These growths are nearly always multiple and may attain enormous size. Since they have greater freedom of growth, subperitoneal fibroids are able to attain a greater size than the other varieties, and apart from degenerative changes, the largest specimens met with are of this description. Fig. 105 is fairly typical of this class. It will be noticed that the uterus itself is not much enlarged and lies in the centre of the mass formed by the tumours; it is also slightly rotated on its long axis, so that the anterior surface faces to the left. On the right side are two subperitoneal growths, sessile, and smooth on their surface; on the left is a single large pediculated growth showing a well-marked nodular surface quite different from those of the other side. Near the right cornu are two smaller growths, the anterior sessile and smooth, the posterior pediculated and nodular. It is obvious that the pedicle of the largest growth is long enough to permit of the occurrence of axial rotation of the tumour or torsion of the pedicle (see p. 256).

Unless inflammatory changes have occurred the peritoneal covering of a subperitoneal fibroid is connected with the tumour only by a thin layer of the general subserous con-

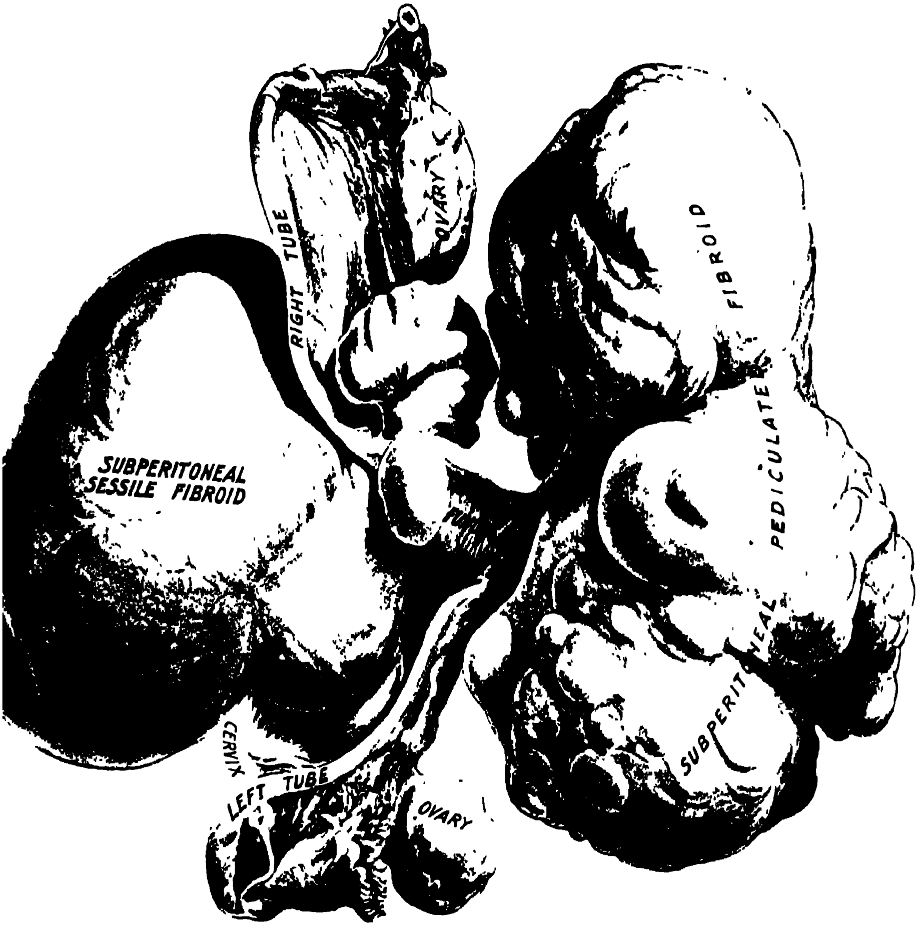

FIG. 105.—MULTIPLE FIBROID TUMOUR, weight 7 lbs. Nullipara, aged 49. The large nodular fibroid had a pedicle two inches long The uterus had rotated, bringing the right cornu forwards.

nective tissue; accordingly it can be readily stripped off when divided. The blood supply is mainly derived through the uterine attachment and is often scanty, these tumours being as a rule less vascular than either of the other varieties.

Sometimes, however, the stalk is thick and fleshy and contains vessels of large size.

Subperitoneal fibroids when of large size rise above the pelvic brim into the abdominal cavity ; when of smaller size they remain in the pelvis, and may then occupy or distend the pouch of Douglas, or rest upon the fundus of the bladder.

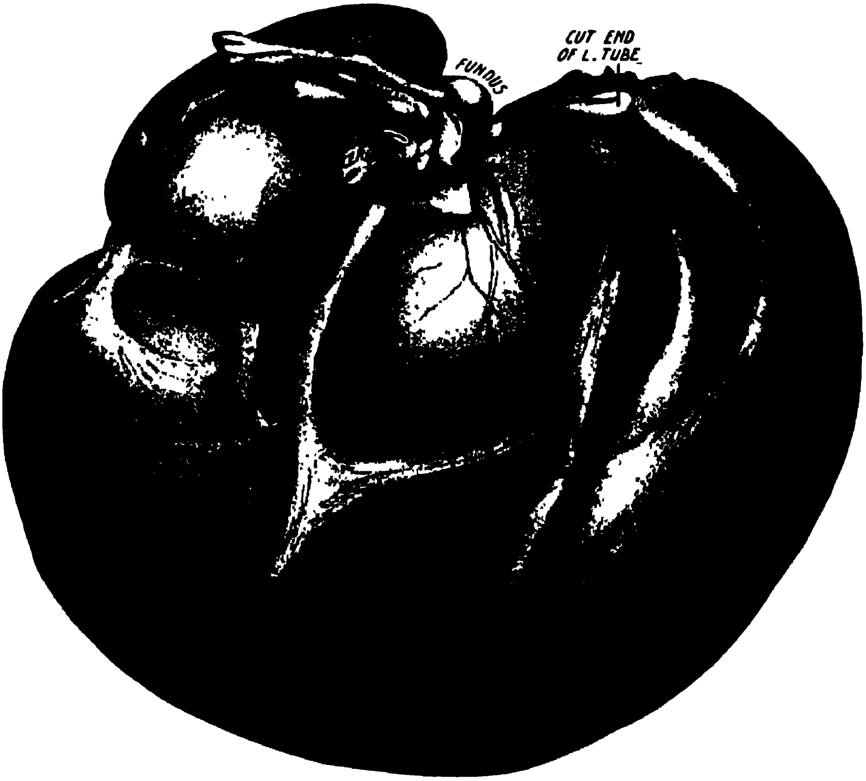

FIG. 106.—LARGE RETROPERITONEAL FIBROID TUMOUR, weight 30 lbs. Nullipara, aged 55. The tumour consists of two lobes of unequal size; between them lies the uterus, which is only slightly enlarged. The larger lobe has expanded the left broad ligament, stretching the tube over it; the left tube is divided near the uterus.

**Retroperitoneal Fibroids.**—Fibroids which grow from parts of the uterus which have no peritoneal covering—the lateral walls, and the anterior wall below the peritoneal reflection—grow out beneath the peritoneum, and when of large size occasion great alterations of the normal pelvic relations.

When in this way they pass between the layers of the broad ligament they first distend that structure (fig. 106), then, growing laterally, they may raise the peritoneum covering the lateral pelvic wall, and open the mesentery of the pelvic colon or sigmoid flexure, so that this part of the gut comes to lie directly upon the surface of the tumour ; on the right side they may pass in the same way behind the cæcum and the vermiform appendix ; passing backwards they may raise the floor of the pouch of Douglas up to the level of the sacral promontory ; passing forwards they obliterate the utero-vesical pouch, raise the bladder high above the pelvic brim, elongate the urethra and displace the ureters. Fibroids which thus distort the general peritoneal relations of the pelvis are often called *retroperitoneal*. An example of a retroperitoneal fibroid is seen in fig. 106. It has opened up the left broad ligament, elongating the Fallopian tube which curves over its surface ; the right broad ligament with its tube and ovary are seen to be unaffected. A great part of this tumour lay beneath the floor of the pouch of Douglas, which was elevated nearly to the level of the sacral promontory. When the ureters are displaced by these growths, sometimes one or other ureter becomes compressed, leading to atrophy of the kidney, or to dilatation of the ureter, and hydronephrosis.

**Interstitial Fibroids.**—These tumours are usually small or of only moderate size ; they cause less distortion of the uterus and less disturbance of the general pelvic relations ~~than subperitoneal fibr~~oids. The enlargement of the uterus which they produce is sometimes fairly symmetrical (fig. 120), but more or less distortion is usually met with. They occur with nearly equal frequency in the anterior and posterior walls, and in the fundus. Solitary fibroids are usually of the interstitial variety, and in such cases the capsule is sometimes absent, giving rise to a diffused growth. The general rule that fibroids are multiple applies, however, to the interstitial variety ; there are generally several, and in the great majority of instances they occur in company with subperitoneal or submucous growths, or both.

**Submucous Fibroids.**—These tumours are always of comparatively small size ; they are generally globular or ovoid in shape, and tend in the natural course of events to become polypoid. Those which encroach upon the uterine cavity *act as foreign bodies in increasing the normal contractions* of menstruation, or actually in exciting contractions in the intermenstrual periods, the effect of which is still further to extrude the tumour until it becomes polypoid. Fibroids which protrude upon the peritoneal aspect do not produce this effect. Submucous fibroids are occasionally solitary, when they symmetrically enlarge the uterus and distend its cavity, which they fill up like a cast (fig. 107). Submucous fibroids are, however, usually multiple, and in such cases various phases of the process of extrusion may be met with in a single uterus, some being still partly embedded in the musculature, others completely submucous but sessile, others definitely polypoid (fig. 108). Occasionally they are so numerous and so crowded together

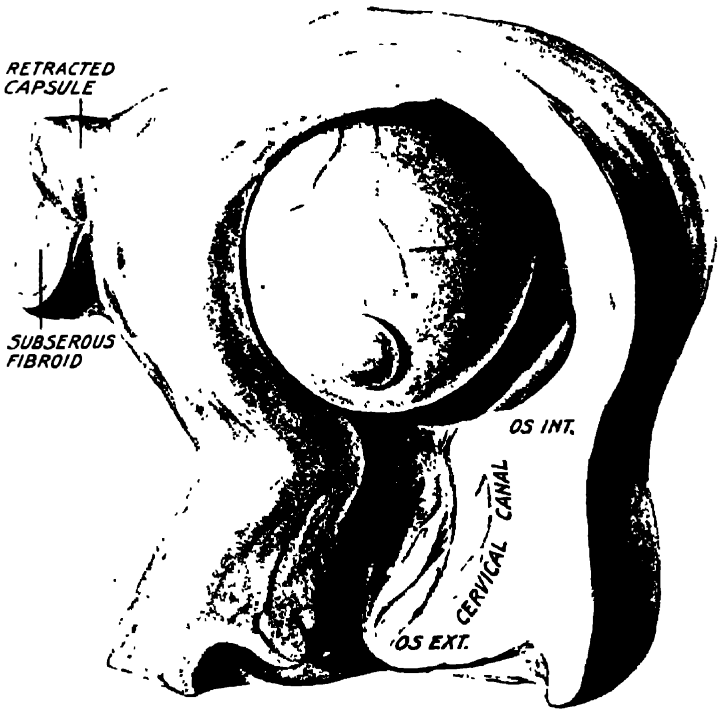

FIG. 107.—SESSILE SUBMUCOUS FIBROID TUMOUR (Charing Cross Hospital Museum). Nullipara, aged 51. The tumour is globular in shape and completely fills up the enlarged uterine cavity.

in the uterine cavity as to become polygonal from mutual pressure, like faceted calculi in the gall bladder (fig. 109).

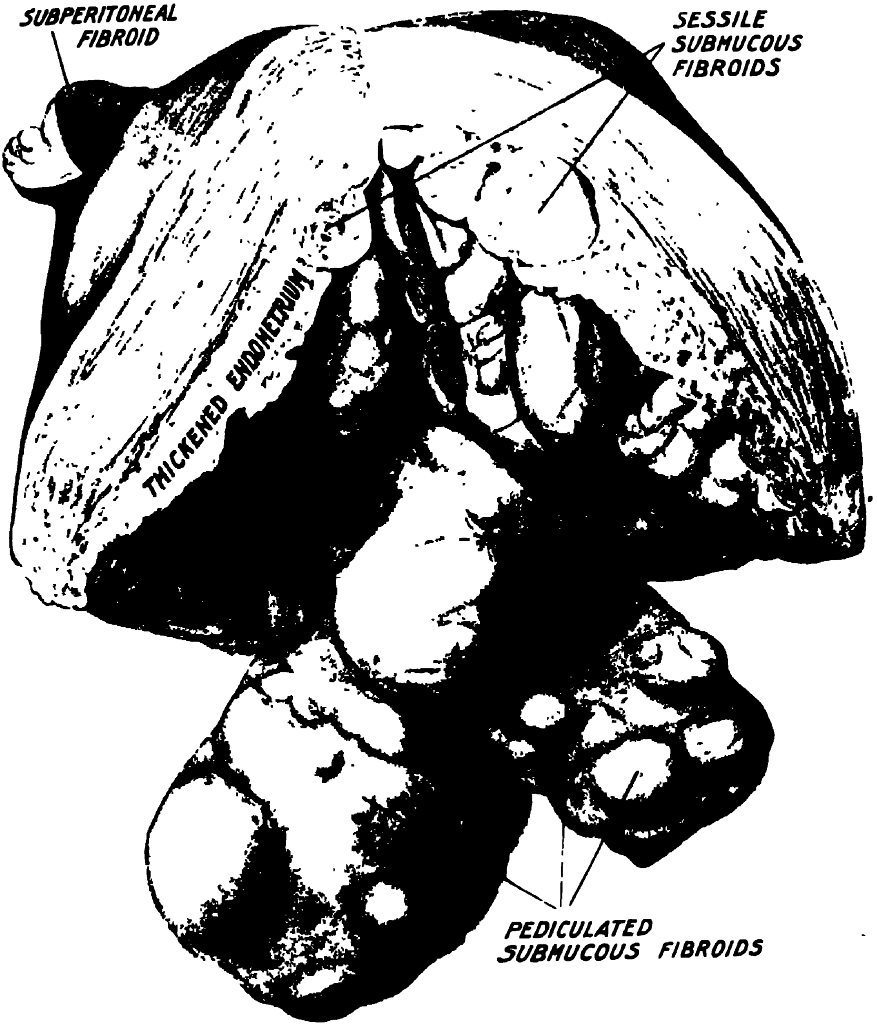

FIG. 108.—UTERUS CONTAINING A LARGE NUMBER OF SUBMUCOUS FIBROID TUMOURS, SOME SESSILE, OTHERS POLYPOID. Nullipara, aged 38. The endometrium is seen to be enormously thickened.

In this specimen the uterine cavity was packed with small submucous fibroids, which had been compressed by being closely packed together.

Like subperitoneal growths submucous fibroids usually present an even surface, but sometimes they are nodular as in fig. 108.

In becoming polypoid submucous fibroids escape from their capsule, and are then covered immediately by the mucosa. The essential steps in the process of pediculation are rupture of the capsule, and subsequent extrusion of the growth from its bed by uterine contractions. When the process of pediculation is complete the pedicle consists of an investment of endometrium, within which is a fibro-muscular core representing what is left of the base of the capsule.

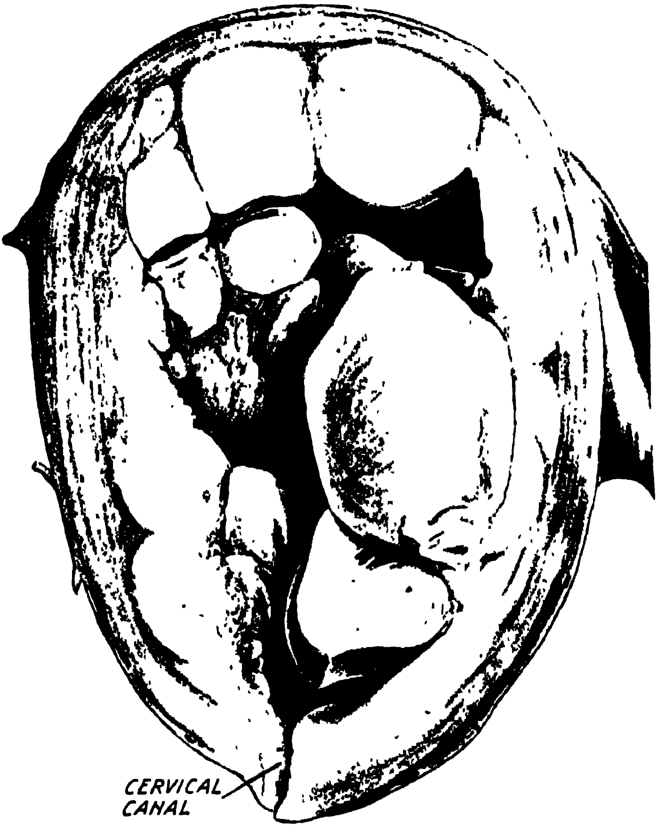

FIG. 109.—MULTIPLE SUBMUCOUS FIBROID TUMOURS. Nullipara, aged 31. The uterus contained sixty separate fibroid growths, the greater number of which were submucous. They were closely packed together in the uterine cavity, and some were moulded by pressure of contiguous growths.

It is seldom more than one-third to a quarter of an inch in thickness. Comparatively few vessels enter the polypus through its stalk, the blood supply being chiefly derived from the covering endometrium. Accordingly, when the pedicle is divided in removing the polypus, there is little or no bleeding from it, for the vessels it contains are small, and are spontaneously closed by retraction of the divided muscular and elastic fibres.

Fibroid polypi not infrequently become expelled through the cervix into the vagina, the cervical canal becoming dilated, as in labour or abortion. Uterine contractions no doubt form the essential factor in this process, the polypus acting as a mechanical dilator; the function known as 'uterine polarity' (p. 142) may aid in producing this result. Elongation of the pedicle occurs during this process, and it is not very uncommon for a stalk one or two inches long to be produced. Complete detachment of a polypus by separation of its pedicle sometimes occurs in the puerperium, but is extremely rare under other conditions; if of small size the tumour is then spontaneously expelled from the vagina; if retained it becomes infected, and sloughing results.

Polypi which have been expelled through the cervix are specially liable to injury and to infection. Superficial ulceration of the mucous covering from friction or other injury may occur, and give rise to serious hæmorrhage. Polypi which have occupied this position for some time may, however, acquire by metaplasia a covering of stratified epithelium similar to that of the vaginal wall; by this they are protected both from injury and infection.

After the polypus has passed through the cervix, the canal retracts upon the pedicle, and though much smaller than the tumour, remains somewhat dilated.

**Cervical Fibroids.**—Only one or two per cent. of fibroids arise in the cervix; the remainder are corporeal. They are almost always solitary, differing sharply in this particular from those of the body. They may arise in the cervix above the vaginal reflection, or in the portio vaginalis itself. Of the former some are interstitial (fig. 110), others are attached to the wall of the cervix by a narrow pedicle and are, strictly speaking, retroperitoneal tumours (fig. 112). Either of these varieties, but especially the latter, may attain a very large size, and from their anatomical relations they naturally give rise to severe pressure symptoms, and *to displacement of neighbouring organs. As will be readily*

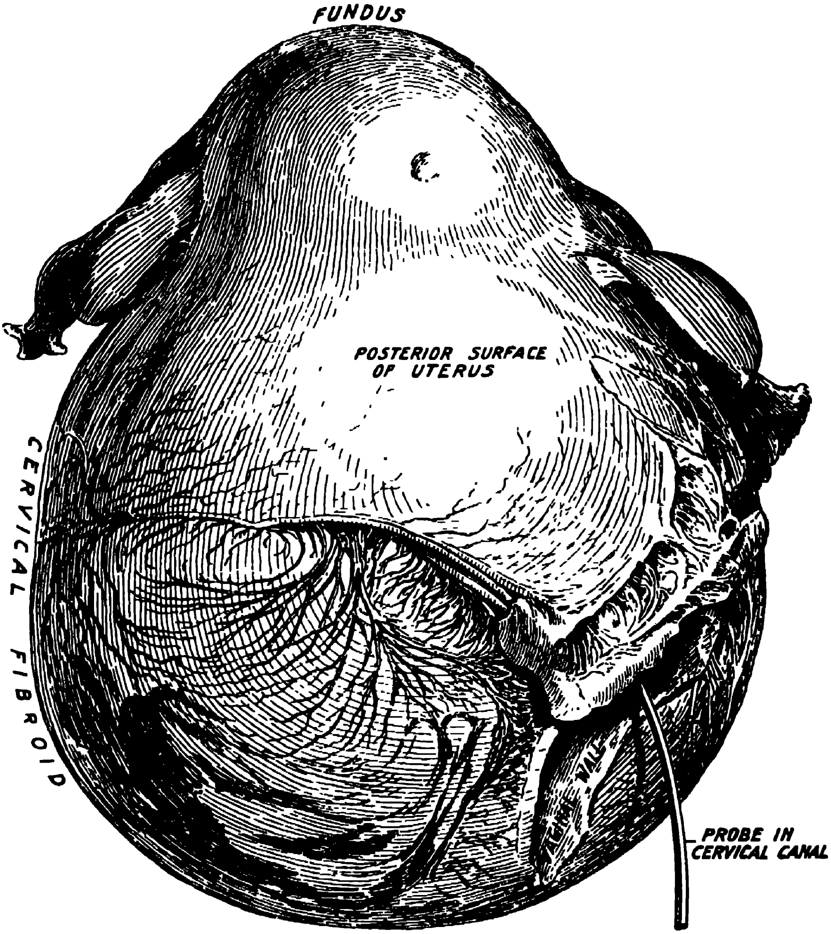

FIG. 110.—INTERSTITIAL CERVICAL FIBROID TUMOUR seen from behind. Multipara, aged 52. The body of the uterus is situated upon the summit of the tumour The cervical canal is displaced backwards and to the right side.

understood from its contiguity to the supra-vaginal cervix, the ureter is liable to displacement, and even to compression, by these tumours.

*Interstitial* cervical growths enormously elongate the cervical canal and displace it, usually to one or other side, sometimes anteriorly or posteriorly (fig. 111). They usually

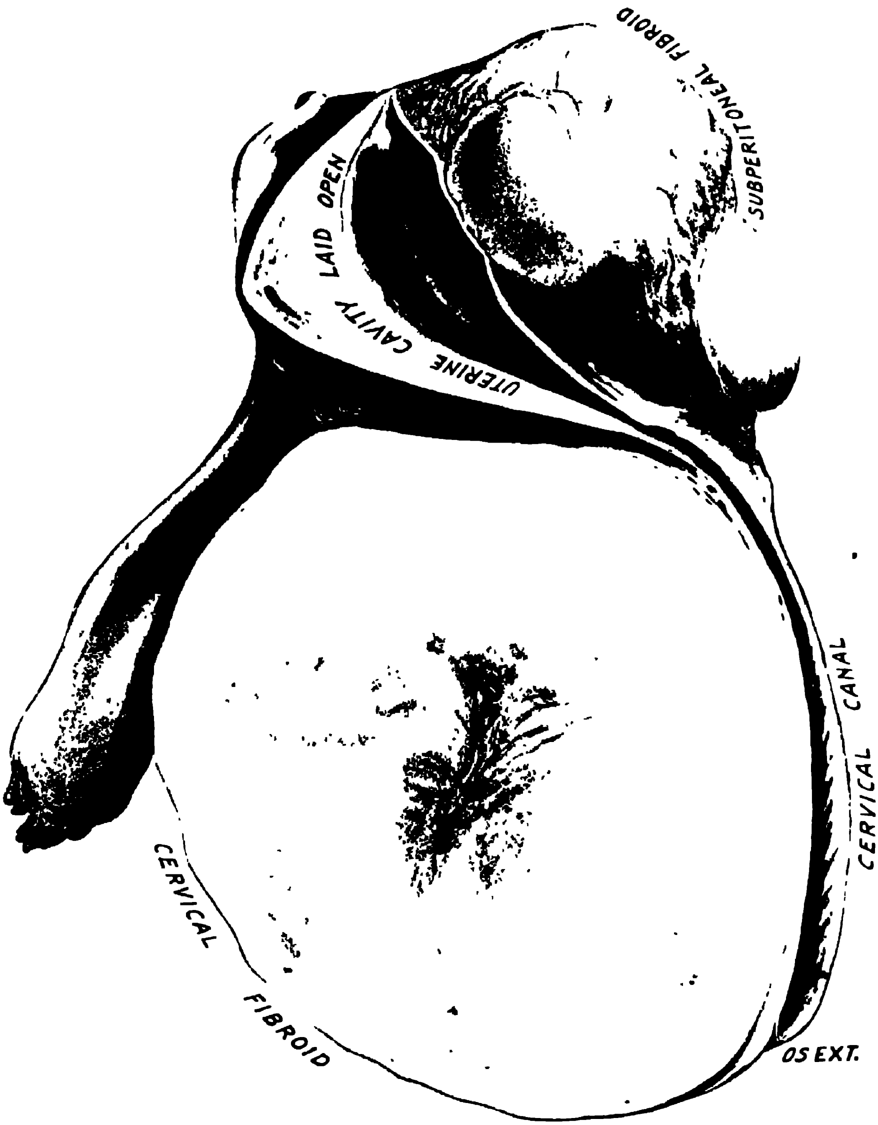

FIG. 111.—INTERSTITIAL CERVICAL FIBROID TUMOUR, DIVIDED ANTERO-POSTERIORLY. Nullipara, aged 32. The cervical canal is displaced to one side and elongated (3¾ inches); the uterine body is elevated above the tumour.

form oval or globular tumours with the uterine body placed upon their summit, which, unless it also contains fibroid growths, remains of approximately normal size. *Subperitoneal* cervical fibroids usually occupy and distend the broad ligament, retaining an attachment by a narrow neck

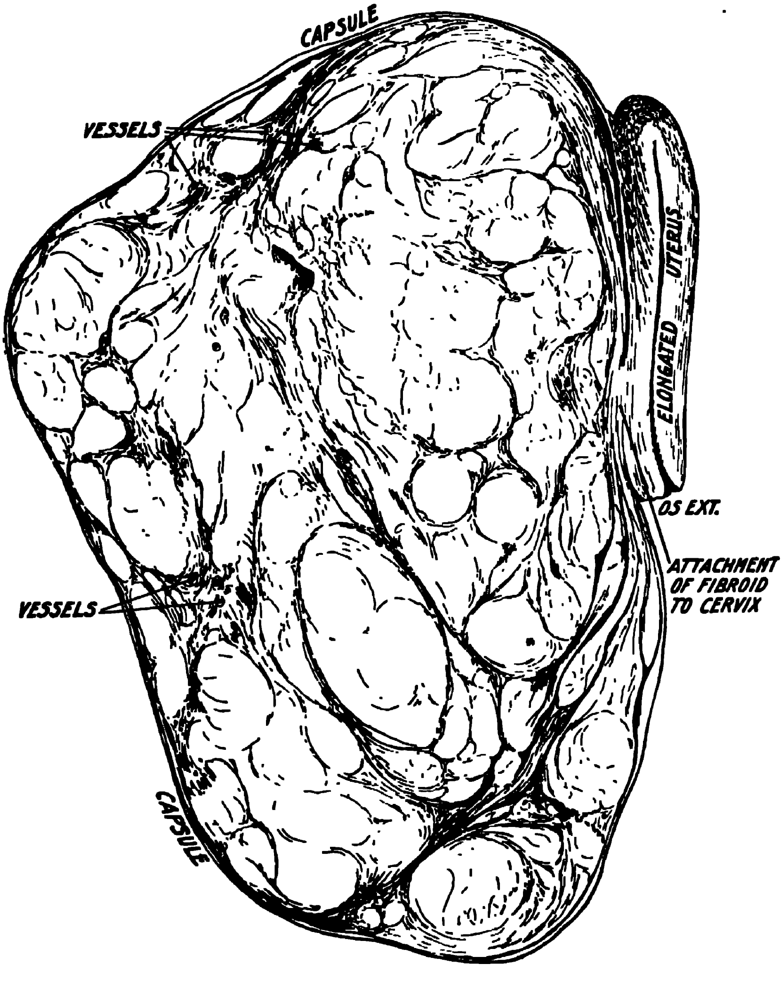

FIG. 112.—CERVICAL FIBROID TUMOUR, INTRA-LIGAMENTARY IN POSITION. Nullipara, aged 47. The tumour is attached to the uterine wall at about the level of the internal os. The uterus is elongated (4 inches) and was displaced laterally by the tumour.

to the supra-vaginal cervix. They are often completely encapsulated as in fig. 112. They displace the uterus to the opposite side of the pelvis and usually elongate it; in the specimen, from which fig. 112 was drawn, the uterus measured four inches from fundus to os externum. In the very large tumour represented in fig. 106 the larger

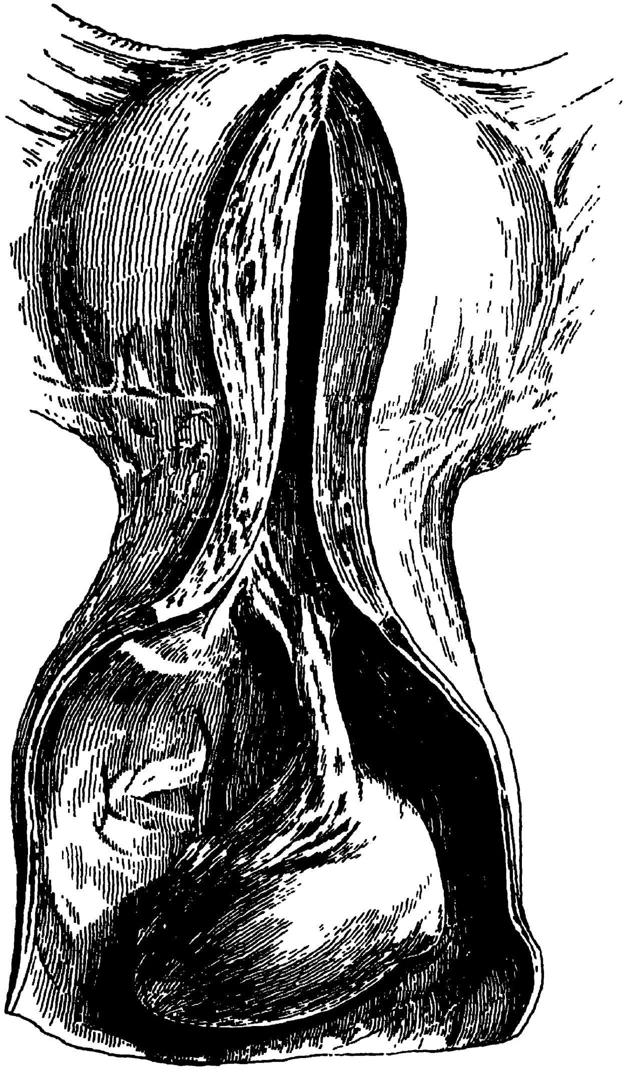

FIG. 113.—FIBROID POLYPUS ATTACHED BY A LONG PEDICLE TO THE POSTERIOR LIP OF THE EXTERNAL OS (Charing Cross Hospital Museum).

lobes had an attachment by a narrow pedicle to the side of the supra-vaginal cervix.

Fibroids growing from the *portio vaginalis* are usually of small size. They begin as interstitial growths, but may become polypoid as in fig. 113, in the same manner as fibroids of the body, i.e. they become extruded beneath the mucous membrane of the cervical canal, and develop a pedicle in the manner already described.

**Coincident Changes.**—The growth of fibroid tumours is frequently attended by a number of other changes in the uterus or the other pelvic organs, which may be called coincident changes, since their etiological relation to these tumours is not settled. The *endometrium* may be entirely unaffected when subperitoneal fibroids alone are present; submucous and interstitial growths are, however, almost always accompanied by marked thickening of the mucous membrane, of the type already described as glandular endometritis (p. 196). The degree of hypertrophy of the endometrium met with when fibroid tumours are present usually greatly exceeds that due to simple glandular endometritis (see fig. 108). To this condition one of the symptoms commonly associated with fibroid tumours is probably due, viz. leucorrhœa, and the increased monthly bleeding, also met with, is probably in part occasioned by the same condition. Mucous polypi may also be found growing from the endometrium in association with fibroids of the body of the uterus (fig. 114).

The *cavity* of the uterus is, of course, greatly enlarged when there are multiple submucous growths as in figs. 108 and 109. It is also enlarged by single submucous tumours such as fig. 107. Interstitial growths distort and displace the cavity without, however, causing much enlargement. Subperitoneal growths may elongate without dilating the uterus. In large multiple tumours of the interstitial variety, the uterine cavity often occupies an excentric position, lying in front, behind, or on one side of the tumour (fig. 111).

*Rotation* of the uterus may occur with fibroids as in fig. 105, where the anterior surface of the uterus was twisted to the left side, and in some cases partial strangulation of the tumour is the result. Large retroperitoneal growths may produce wide displacements of the uterus, elevating it high above the pelvic brim, or displacing it far to one or other side (fig. 106). Pediculated submucous growths attached to the fundus may cause chronic inversion of the uterus (see p. 184).

*Ovaries and Fallopian Tubes.*—Recent observations upon fibroid uteri removed by operation have made it abundantly clear that coincident disease is frequently present in the tubes and ovaries. Tracey has recently collated a large number of cases (3561) recorded by different operators, and in this series it was found that 20 per cent. showed definite disease in the ovaries, and that a somewhat smaller proportion—14·5 per cent.—showed definite morbid changes in the Fallopian tubes. Among the conditions thus met with may be mentioned cystic tumours of the ovaries, chronic inflammation of the ovaries, hydrosalpinx and pyosalpinx. This high rate of frequency clearly points to something more than coincidence; in all probability there is a causal relationship between these morbid conditions, but which is primary and which consecutive we do not at present know.

*Blood-vessels.*—The uterine arteries form the main blood supply of large fibroid tumours; they may be greatly hypertrophied, and irregularly distributed over the growth, sometimes entering it in front or behind instead of at the side. The ovarian arteries are usually much less hypertrophied than the uterine arteries. Large venous plexuses are usually found in the broad ligaments, and sometimes superficial veins of very large size, covered by peritoneum only, course over the surface of the tumour. These varices may rupture either spontaneously or as the result of traumatism, causing serious internal hæmorrhage.

**Adenomyoma of the Uterus.**—The occasional occurrence in fibroid tumours of gland tubules surrounded by a highly cellular stroma, has been already mentioned. The subject was first systematically examined by von Recklinghausen in 1896, who came to the conclusion that these tubules were derivatives of portions of the Wolffian duct which had persisted in the walls of the uterus. Further examination of such cases has, however, shown that the endometrium is certainly the source of these glandular elements in the great majority of cases, and the inference is fair that it must be so in all.

*Diffuse Adenomyoma.*—In this form the growth occurs as a diffuse non-encapsuled tumour, producing a symmetrical enlargement of the body of the uterus. In a consecutive series of 1283 cases of fibroids Cullen found this tumour in 5·7 per cent; it is accordingly not very uncommon. When the uterus is laid open the endometrium is found to be greatly thickened, and beneath it is an irregular zone of whorled tissue resembling a fibroid in general characters, and indistinctly differentiated by an irregular border from the fibro-muscular tissues of the uterine wall (fig. 114). The uterine cavity is not as a rule encroached upon, but independent fibroid tumours may also be present, causing distortion and further enlargement of the whole organ. The growth cannot be shelled out of the uterine wall. It has been found in the cervix as well as in the body.

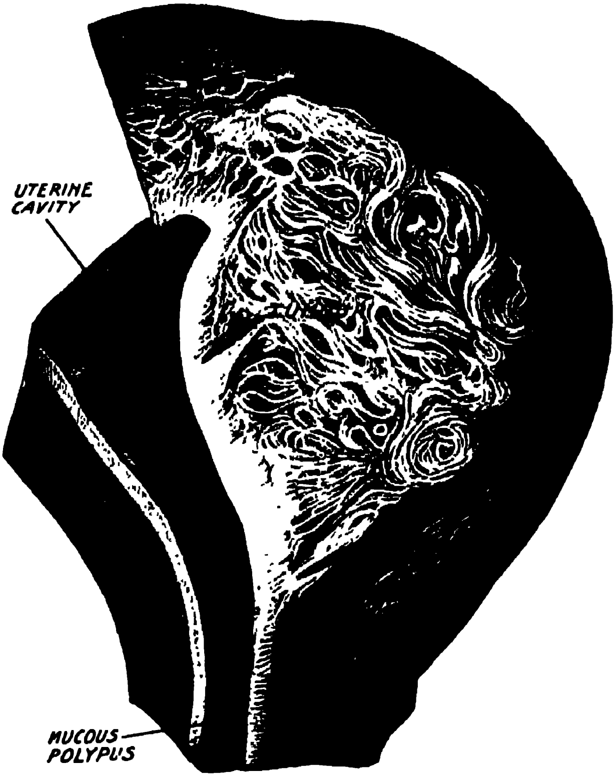

Fig. 114.—Adenomyoma of the Uterus, diffuse form (Cullen).

On microscopic examination the growth is seen to consist mainly of intersecting bundles of muscle and fibrous tissue like a fibroid. Into this tissue processes dip down from the endometrium; sometimes these processes consist of a single gland, more often they consist of clusters of glands surrounded by a zone of cellular tissue exactly resembling the stroma of the endometrium. These processes may be traced deep into the growth. The gland tubules are lined with a single layer of columnar ciliated epithelium

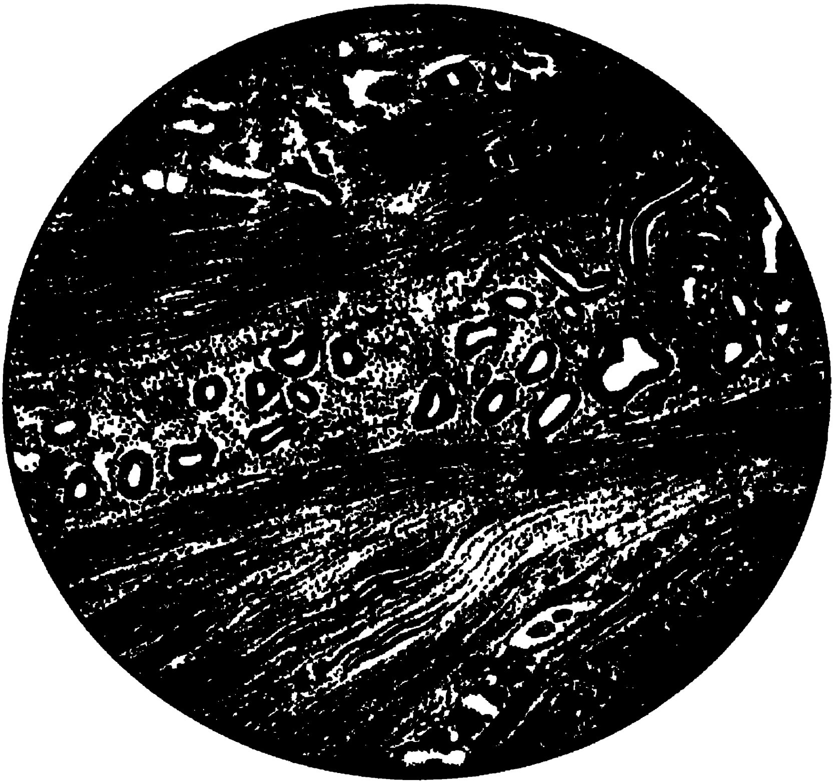

FIG. 115.—ADENOMYOMA OF THE UTERUS. The section shows columns of glandular tissue enclosed between parallel bundles of muscle fibre. The glandular tissue consists of gland lumina embedded in a highly cellular stroma.

(Cullen), and sometimes small cystic dilatations are formed upon them. In the parts near the uterine cavity the connection of the glands with the mucosa can be directly traced; in the outlying portions isolated clusters of glands alone are to be found.

Adenomyomata of characters identical with these are sometimes found as submucous, subperitoneal, or intraligamentary growths; they are less frequent than the diffused form. They are especially prone to the formation of cystic spaces in their interior, the glandular origin of which is shown by the fact that they possess a lining of epithelium which in parts is columnar. In the case of subperitoneal growths the occurrence of glandular elements is at first sight difficult to explain, but the simple explanation which has been advanced by Cullen is probably correct, viz. that such growths were originally interstitial and have only become subperitoneal by a process of outward extrusion from the uterine wall.

In their clinical features adenomyomata show little that is distinctive from fibroids as regards age of occurrence or symptoms. Diagnosis is therefore impossible without a microscopic examination.

## CLINICAL FEATURES OF FIBROID TUMOURS

Uterine fibroids are among the commonest tumours to be found in the human body. In the uterus they occur very much more frequently than any other new growth. They arise in the period of possible sexual activity—15 to 45 years; before the age of 25 they are rare, before the age of 20 they are very rare, and their occurrence before puberty has never been satisfactorily demonstrated. They may be first discovered after the menopause has been passed, but in such cases they have probably been in existence for many years previously. Conflicting statements have been made as to the relative frequency of their occurrence in married and in unmarried women; it appears, however, that while their formation is quite independent of sexual activity, their subsequent development is largely accelerated by sexual intercourse and child-bearing. Certainly a predominant number of the cases which give rise to symptoms, and so come under clinical observation, occur in married women or in unmarried parous women; but when these classes are excluded the remaining female population is relatively small, and the occurrence among them of fibroid tumours which give rise to symptoms must of necessity be relatively infrequent.

**Symptoms.**—In a large number of cases fibroid tumours give rise to no symptoms either direct or indirect; such latent tumours may, however, at any time undergo changes which lead to the appearance of symptoms of greater or less urgency. The number of women, subjects of these tumours, who go through life without at some time suffering ill effects from them, is probably very small indeed; but these ill effects may be delayed for many years under favourable circumstances.

The direct symptoms to which fibroid tumours may give rise are *hæmorrhage, pain* and *abdominal enlargement*; indirectly they may also cause *leucorrhœa, pressure symptoms* of varied character, *disturbances* of the *reproductive* function, *anæmia, constipation* and *dyspepsia.* It will be apparent that these symptoms may be met with in a variety of different combinations, giving rise to many changes in the clinical picture, and the subject will be best elucidated by attempting to indicate the conditions under which individual symptoms may occur, or in which they become obtrusive or urgent.

*Hæmorrhage.*—Subserous fibroids do not appreciably affect the amount of blood lost during menstruation, nor do they ever cause metrorrhagia. Interstitial and submucous fibroids usually cause some increase in the monthly loss, but in the great majority this is not severe. Three factors in the causation of hæmorrhage from fibroids must be recognised: (1) the increased size of the uterine cavity, and therefore of the area covered by endometrium; (2) the coincident thickening of the mucosa which has been already described; (3) the mechanical obstacle to muscular contraction offered by the tumours. The importance of muscular contractions in arresting uterine hæmorrhage has been already referred to in connection with menstruation. There is often some disturbance of the menstrual rhythm in the direction of shortening the intervals and prolonging the periods, but there is usually no intermenstrual bleeding. Profuse irregular hæmorrhages may, however, occur with submucous growths or fibroid polypi, or during the process of their formation, by extrusion from the uterine wall; and also when infection of a fibroid has occurred or when it is undergoing malignant changes. In these cases the menstrual rhythm is greatly disturbed, and bleeding is sometimes continuous. The size of a fibroid tumour bears little relation to the amount of bleeding which it may cause; small submucous growths, or small adenomyomata, being often found clinically to produce very severe hæmorrhage.

Instances of death directly from hæmorrhage are extremely rare, but nevertheless such a termination may undoubtedly occur. Prolonged or repeated attacks of bleeding, although not ending fatally, lead to chronic anæmia, and in turn to other results which undermine the patient's powers of resistance should an intercurrent illness arise.

Internal bleeding from the traumatic or spontaneous rupture of a large vein running over the surface of a fibroid tumour sometimes occurs, and has been known to terminate fatally. A few rare cases have been also recorded in which internal bleeding due to laceration of a fibroid tumour by traumatism has been found.

When a fibroid tumour is present, menstruation commonly continues until the age of fifty has been exceeded, i.e. the occurrence of the menopause is delayed. Abnormal bleeding, at about this time of life, may usually be taken to indicate degenerative changes in the tumour, or possibly the supervention of malignant disease.

*Pain.*—Fibroid tumours, as a rule, are not sensitive to touch, nor do they give rise to spontaneous pain. In a certain number of cases, however, they cause dysmenorrhœa. The formation of intra-uterine polypi is often accompanied by severe dysmenorrhœa, produced by spasmodic contractions of the uterine muscle. The occurrence of pain is, however, by no means invariable in these circumstances. The further extrusion of the polypus from the uterine cavity through the cervix into the vagina may also produce dysmenorrhœa in the same way. A certain amount of increase in the pain which usually attends menstruation is not uncommon with interstitial and submucous growths of all sizes. In all these cases the menstrual interval is free from pain. Intermenstrual pain may be set up by coincident disease in the tubes and ovaries, by pressure, or by inflammatory changes in the peritoneal covering, or in the substance, of the tumour. When tubal or ovarian diseases, such as those mentioned on p. 236, are present, it is clear that the clinical features must be correspondingly complex ; in some cases acute, in others chronic pain will naturally be a prominent feature. Infection of a fibroid uterus may give rise to acute symptoms resembling those of an attack of pelvic peritonitis, and after the first attack has subsided recurrence may ensue. Adherent fibroids are, however, often encountered in which no history of an acute attack can be obtained, but more or less constant and severe pain has been complained of. Axial rotation of a subserous tumour, or of a fibroid uterus, may also cause acute pain. Fibroids which occupy and approximately fill the pelvic cavity usually cause backache and pain in the flanks passing down the thighs ; it is usually attributed to pressure upon the nerves which leave the pelvis through its foramina, but in some instances large tumours in this situation do not cause pain at all.

It follows from what has just been said that dysmenorrhœa is the only variety of pain which is at all frequent in fibroid tumours. Intermenstrual pain is exceptional and is usually the result of secondary changes in the tumour, or of coincident disease of the tubes and ovaries. Occasionally it is due to pressure.

*Leucorrhœa* is common in submucous fibroids attended with thickening of the endometrium and with the formation of polypi ; the discharge is of the usual whitish-yellow colour and is inoffensive in odour. It is obvious also that similar discharges arising from cervical catarrh or from chronic vaginitis may be coincident with, but not dependent upon fibroids. Offensive discharges occur from infected fibroids with sloughing or suppuration, and sometimes a brownish watery discharge is met with in necrosis and in other forms of degeneration.

*Pressure Symptoms.*—This term is often used vaguely, but is generally intended to include disturbances of the functions of the bladder, pain and constipation ; and also, in the case of very large tumours, disturbances of the circulation in the lower extremities, and of the functions of the stomach, heart and lungs, from upward displacement of the abdominal viscera and diaphragm. It is certain that in many cases some of these symptoms arise not from the pressure exerted by the tumour but from coincident neurosis. Symptoms such as those of dyspepsia, irritability of the bladder, and pain of variable and irregular incidence, cannot be attributed to 'pressure' without some reservation, and indeed are often frankly functional in character. Fibroids which occupy and practically fill the pelvic cavity disturb the functions of the bladder and rectum by direct pressure. Not infrequently such tumours produce much the same effect as a retroverted gravid uterus of the same size, i.e. they elongate and constrict the urethra and produce retention of urine and overdistension of the bladder. Retention of urine is also sometimes caused by prolapse of a uterine fibroid tumour. In the phase of premenstrual congestion fibroid tumours often become recognisably enlarged, and accordingly attacks of retention of urine are apt to coincide with menstrual periods. Pelvic fibroids of somewhat smaller size may cause frequency of micturition and pain or discomfort in urination, since the bladder supports their weight. Owing to its position in the sacral hollow the effects of pressure on the rectum are much less marked than upon the urethra and bladder. Constipation attributed to the pressure of a pelvic tumour is very frequently found to be quite unrelieved by removal of the tumour.

Occasionally one of the ureters is subjected to compression, leading to atrophy of the kidney, or to dilatation of the ureter and renal pelvis (hydronephrosis) ; this occurrence is very rare and has been observed chiefly in connection with retroperitoneal growths which have caused an extreme degree of displacement of the pelvic organs. It is quite possible for the ureters to be greatly displaced from their natural position without any resulting obstruction to the passage of urine through them.

The most uncommon of all the results of pressure exerted by fibroid tumours is *intestinal obstruction*, the number of recorded cases being very few ; a singularly large proportion have occurred in elderly women, the fibroid being found to be calcified.

From the foregoing account it will be seen that while the presence of a fibroid tumour is not incompatible with good health, a certain amount of disturbance of health is usually met with. Certain risks are, moreover, inseparable from them, viz. hæmorrhage—severe or in exceptional cases fatal, retention of urine, compression of the ureter, necrosis, suppuration or sloughing of the tumour, and the supervention of malignant disease. It is extremely rare for fibroid tumours to become directly the cause of death. Nevertheless far-reaching ill effects are often produced by them. Thus *profound anæmia* may ensue upon long-continued or repeated losses of blood; cure of the anæmia is impracticable while the loss of blood is but imperfectly controlled, and chronic anæmia may lead to thrombosis of veins, to fatty degeneration of the cardiac muscle and the arterial walls, and many other ill effects of less serious import. Degenerating fibroids sometimes produce serious disturbance of the general health, of the probable nature of *toxæmia*, and infected fibroids may result in *septic absorption*.

**Physical Diagnosis.**—In the great majority of cases fibroids form solid tumours sharply defined in outline, of hard consistence and fairly free mobility; the body of the uterus is incorporated in the tumour except in certain cases of stalked subserous fibroids, the attachment of which to a practically unaltered uterus can be made out. The uterus thus enlarged by fibroid tumours may assume a variety of shapes and sizes.

It may be *symmetrically* enlarged and retain its median position in the body. This will occur with submucous growths, which, it will be remembered, seldom attain a very large size. The enlargement is usually more or less globular in shape, and the walls of the uterus are smooth and regular. Small interstitial fibroids produce an enlargement of similar general characters; but large growths of this variety almost always distort the uterus, producing a tumour of irregular shape. Lengthening of the uterine cavity may be detected if the sound is passed; but growths projecting from the inner wall often check the passage of the sound, and give rise to a false impression by preventing the instrument from reaching the fundus. If there is no impediment to the passage of the sound it may register a length of five or six inches; under no other conditions, except pregnancy, is the uterine cavity so greatly lengthened as with a fibroid tumour.

Symmetrical enlargement due to a fibroid tumour must be carefully distinguished from that due to pregnancy. Difficulty is especially likely to arise in distinguishing between a retroverted gravid uterus, and a pelvic fibroid attached to the posterior uterine wall. Retention of urine may occur in both cases, and two of the presumptive symptoms of early pregnancy, viz., sickness and the presence of secretion in the breasts, may be met with in association with fibroids. Great importance attaches to amenorrhœa, for this symptom is extremely rare in connection with fibroids except when pregnancy occurs, or when the climacteric age is reached. The gravid uterus is soft and elastic in consistence, and may be felt to undergo intermittent contractions; the fibroid is usually densely hard and resistant, and much better defined in outline than the gravid uterus; but from degeneration fibroids may undergo so much softening as closely to resemble pregnancy. In these circumstances the condition of the cervix becomes a point of great importance: in pregnancy it is always definitely softened when the third or fourth month is reached; in fibroid tumours softening of the cervix never occurs. Accordingly the recognition of a softened cervix will often decide the diagnosis of a doubtful case in favour of pregnancy.

Small tumours of whatever shape are usually entirely *pelvic in position*, and are then discovered only on internal examination. Backward displacement and descent of the uterus are frequent complications. Retention of urine may occur if the tumour is large enough practically to fill the pelvic cavity, and the presence of an overdistended bladder may then obscure the diagnosis. Cervical fibroids are always mainly pelvic in position; they may push up the unenlarged uterine body above the level of the pubes, where it will appear as a pear-shaped movable boss on the summit of the tumour, and may be mistaken for a subperitoneal growth (fig. 110). Retroperitoneal fibroids also always occupy a great part of the pelvis, although they may be large enough nearly to fill the abdominal cavity as well. Pelvic fibroids which have become adherent, or which from their size have become tightly wedged in the pelvic cavity so that they cannot be pushed up above the pelvic brim, are said to be *incarcerated*.

As a rule the fibroid uterus forms a tumour ~~of~~ *irregular shape*, and since the fibroids are usually multiple, the surface of the tumour is often broken by nodular elevations, or by rounded projecting bosses of large size, representing subperitoneal growths. These bosses may be felt to be movable upon the subjacent main tumour. Small multiple subperitoneal growths are frequently detected on the surface of the uterine body, which they enlarge in size and distort in shape. Large tumours are seldom of uniform consistence; unaltered parts are firm and inelastic; some parts may be elastic from softening due to degeneration; tumours which have become calcified, on the other hand, may be of stony hardness. Large interstitial or mixed tumours often, but not invariably, yield a well-marked uterine souffle similar to that of pregnancy; this forms a useful point of distinction from solid tumours of other organs. The larger tumours are mainly abdominal in position, and not infrequently they do not occupy the pelvis at all, but lie entirely above the level of the pelvic brim.

In a few instances a small amount of ascitic fluid is found in connection with an innocent fibroid tumour; a considerable amount of fluid is usually due either to some independent cause such as hepatic cirrhosis, or to malignant changes in the tumour.

Attention should be paid to the *cervix* in cases of fibroid tumours. Its consistence is often abnormally hard and resistant. In cases of retroversion it is displaced upwards and forwards towards the pubes, and usually retains a fair amount of mobility. In some cases of large retroperitoneal growths it is displaced in this way to an extreme degree, being so high as to be nearly out of reach of the examining finger. Sometimes, on the other hand, fibroid tumours cause prolapse of the first or second degree, and in the latter the cervix protrudes from the vulva. In the case of interstitial cervical fibroids the vaginal portion of the cervix may be almost entirely taken up into the tumour; in place of the cervix is then felt a hard, smooth, convex mass projecting into the vaginal canal, and forming the lower pole of a large solid pelvic tumour. On careful examination the external os will be detected upon the surface of the mass, and this will reveal the nature of the condition. In other cervical fibroids a small portion of the vaginal cervix may be preserved, when the condition is of course easier to recognise.

The differential diagnosis of fibroids and ovarian or other abdominal tumours will be considered on p. 388.

## SECONDARY CHANGES IN FIBROID TUMOURS

Fibroid tumours are liable to undergo various morbid alterations, which may be classified for descriptive purposes as follows :

- A. *Degenerations*—
    - Atrophy ;
    - Fatty degeneration ;
    - Calcareous degeneration (womb-stones) ;
    - Necrobiosis ;
    - Myxomatous or hyaline degeneration ;
    - Cystic degeneration.
- B. *Circulatory Changes*—
    - Œdema ;
    - Axial rotation leading to—
        - Congestion ;
        - Interstitial hæmorrhage ;
        - Necrosis ;
        - Detachment of tumour.
- C. *Infection leading to*—
    - Inflammation ;
    - Suppuration (localised abscess) ;
    - Gangrene and sloughing.
- D. *Malignant Changes*—
    - Carcinoma ;
    - Sarcoma.

**Degenerations.**—(1) *Atrophy.*—After the climacteric period has been passed a certain number of fibroid tumours undergo spontaneous atrophy, becoming reduced in size, and possibly in a few rare cases becoming so small as to be imperceptible to clinical observation, thus giving rise to the belief that they have totally disappeared. It is very difficult to form any reliable estimate of the proportion of cases in which a change of this kind occurs ; it is probably very much rarer than was formerly supposed, and is, indeed, an exceptional, not an ordinary, sequence of the change of life. Not infrequently fibroid tumours undergo rapid increase in size after the menopause ; almost invariably this is from degenerative processes, not from active growth. It has been suggested that those which actually increase in size by growth after the menopause are the true *myomata*, but this suggestion has never been confirmed by actual demonstration.

Atrophy, when it occurs, is no doubt brought about by the same causes as those which induce atrophy of the healthy uterus at this period of life. This matter has already been discussed (p. 81) in connection with the cessation of menstruation. The low degree of vascularity of the greater number of fibroid tumours obviously renders them unusually liable to suffer from the effects of diminished blood supply.

(2) *Fatty and Calcareous Degenerations.*—These changes seldom occur in fibroids except as a sequence of post-climacteric atrophy, and they are then the direct result of diminished blood supply. They do, however, occasionally occur in fibroid tumours earlier in life, during the period of menstrual activity. Usually the changes begin in the central parts of the growth, which, it will be remembered, are the least vascular ; they may, however, begin in the peripheral parts, resulting in calcareous incrustation of the tumour in the neighbourhood of its capsule. Areas of fatty degeneration are yellowish in colour, and the tumour in which they occur is usually densely hard, and pale in colour. Calcareous patches are opaque and whitish, and may be of the consistence of putty, but more often are hard and gritty to the touch. Occasionally these changes proceed so far as to infiltrate the whole tumour with calcareous material, resulting in the formation of a 'womb-stone'—a petrified mass resembling a large calculus.

Fibroids which have undergone these changes do not as a rule give rise to symptoms, and are discovered, if at all, by accident. It is possible, however, for a 'womb-stone' to be spontaneously expelled by sloughing from the uterus, and an instance of this kind in a woman of thirty-five has been recorded by Worsley-Taylor.

(3) *Necrosis or Necrobiosis* (*Red Degeneration*).—This condition is a form of cellular degeneration which occurs with comparative frequency in fibroid tumours. It affects all varieties of fibroid tumour, but is most common in the interstitial ones. In Tracey's series of operation cases (3561) it was found in 5 per cent. of the tumours examined ; in

other words, it occurs in one in twenty cases of fibroids which require surgical interference, but its general incidence is, of course, much less than this. Tumours thus affected are always of relatively soft consistence, the softening being the result of the degenerative changes. The cut section is of a dull red colour resembling that of raw beefsteak, and in the fresh state the tumour sometimes gives off a slight stale or fishy odour. The peritoneal covering, in the case of subserous growths, may show the same coloration. Specimens are not infrequently met with in which only the central parts of the tumour are affected, the remainder being unaltered; this clearly indicates that the process starts in the centre, as would be expected from the fact that the centre of a fibroid tumour is of lower vascularity than its periphery. Areas of interstitial hæmorrhage may be seen with the naked eye in some cases.

The final stage of the process consists in liquefaction of the degenerated tissues, and the consequent formation of cystic cavities in the tumour. By fusion of neighbouring cavities a large tumour may in this manner be almost entirely destroyed, and converted into a cyst with thick, ragged walls (fig. 118), commonly known as a fibro-cystic tumour. The fluid contents of such cystic spaces are thick and chocolate coloured, containing altered blood and tissue débris.

On microscopic examination the affected tissues show two main changes: (1) degeneration of fibres, indicated by imperfect staining, or disappearance of nuclei, with vacuolation of the perinuclear protoplasm; (2) extensive thrombosis of vessels, and red coloration of the tissues by extravasated and altered blood. Fatty degeneration is also found in the altered tissues. Lorrain-Smith has shown that bacterial infection of fibroids thus affected may occur, and this observer has actually demonstrated the presence of staphylococci in one case and a diplococcus in another. In most instances, however, which have been examined bacteriologically, the result has been negative, and it appears that bacterial infection when present must be regarded as a sequence of red degeneration, not as its cause.

Certain *clinical features* of this form of degeneration deserve notice. Thus pregnancy is in some way a powerful exciting cause of necrosis in fibroids, for in a large proportion, estimated by some writers at 80 per cent., the subjects of the disease are parous women. Frequently, it actually arises during the course of pregnancy or early in the lying-in period, and directly gives rise to conditions which necessitate immediate operation. Its age-incidence shows no special features.

Pain is frequently met with, and as uncomplicated fibroids usually give rise to no pain, this symptom deserves careful attention. It may in some cases be very severe, and has led to a mistaken diagnosis of an ovarian tumour with axial rotation of the pedicle. Frequently also the tumour is tender to the touch. The growth is of comparatively soft consistence, and rapid increase may be noted in cases where the previous size of the tumour has been observed Fever is rarely met with and there are no constitutional symptoms. Menorrhagia is not a marked symptom of this form of degeneration, which may to some extent be accounted for by its close association with pregnancy and the puerperium.

*Myxomatous or Hyaline Degeneration.*—This change consists in destruction of the tissue elements of the tumour by liquefaction due to necrosis or myxomatous transformation. Fibroids thus affected are of soft consistence, and on their cut section they do not show the glistening surface nor the characteristic whorled appearance seen in fig. 114 They are dull and homogeneous in appearance, and, in well-marked examples, show numerous spaces of varied size and shape, containing fluid. The smaller spaces contain a yellowish material which is of viscid or gelatinous consistence, being rich in albumen; in the larger ones the fluid is thinner, and greenish or brownish red in colour. The spaces are irregularly distributed and their walls are usually ragged and irregular (fig. 118). In well-marked instances of myxomatous degeneration it is not uncommon also to find great dilatation of the lymphatic trunks which run from the uterus in the upper part of the broad ligament; or, instead of the lymphatic trunks being dilated, collections of clear fluid may form in the connective tissue spaces of the broad ligament and may extend over the pelvic brim beneath the peritoneum of the posterior abdominal wall.

On microscopic examination it is seen that the morbid change begins in cell-destruction by liquefaction (fig. 117), resulting in the disappearance, first of the cell-bodies, and then of their nuclei. In this way small spaces are formed which by fusion produce larger spaces, until cavities visible to the naked eye finally appear. The change proceeds irregularly and does not tend to begin in the centre of the tumour, as in the case of necrosis and fatty degeneration.

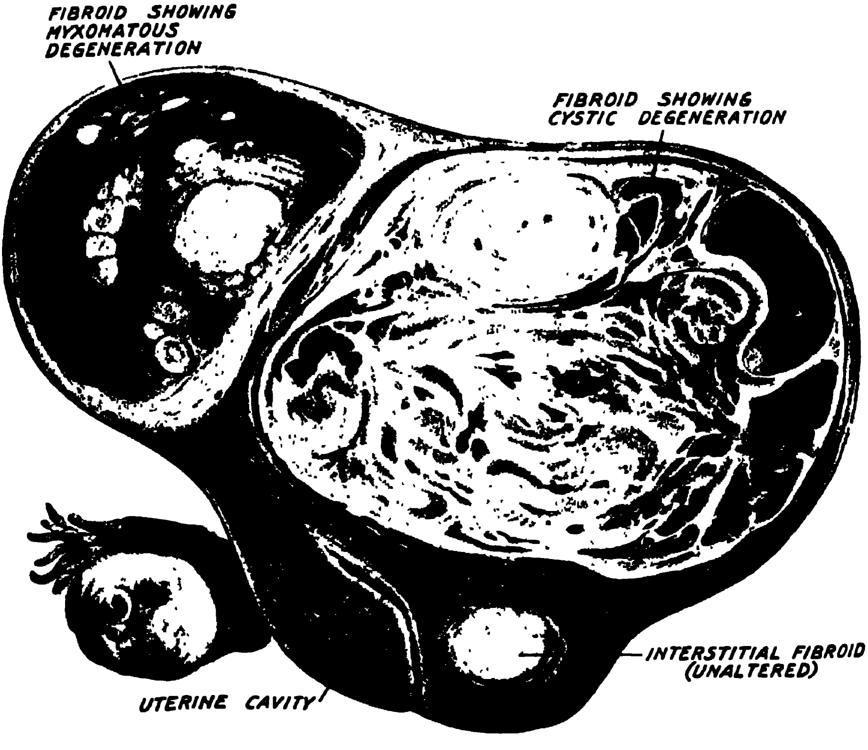
FIBROID SHOWING MYXOMATOUS DEGENERATION
FIBROID SHOWING CYSTIC DEGENERATION
INTERSTITIAL FIBROID (UNALTERED)
UTERINE CAVITY

FIG. 116.—MULTIPLE FIBROID TUMOUR OF THE UTERUS. Multipara, aged 39. The largest fibroid shows well-marked cystic degeneration; the smaller one on the right shows an earlier stage of the same process.

Myxomatous fibroids are frequently much more vascular than the unaltered tumours, and sections of large well-developed arteries may be met with in their substance. Frequently also these vessels show irregular thickening of their middle coats (atheroma obliterans) as shown in fig. 117. Œdematous changes are also often present.

This form of degeneration is extremely common; nearly all large fibroids, when carefully examined, are found to contain areas in which the early stages of this process may be observed with the microscope. In the majority of such cases the changes do not proceed far enough to occasion alterations visible to the naked eye. The changes appear to begin in, and primarily to affect, the fibrous tissue elements of the tumour, unaltered muscular elements often being found surrounded by areas in which the degenerative changes have reached an advanced stage.

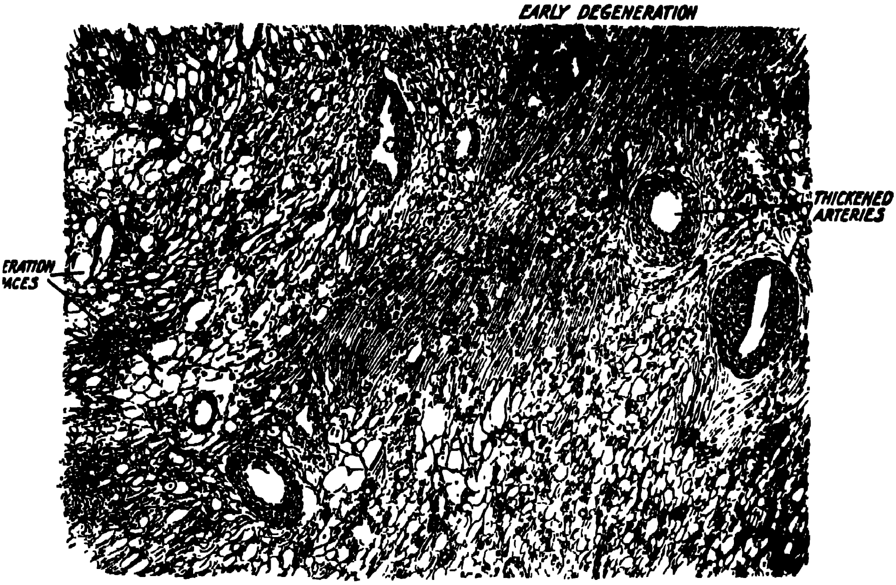

FIG. 117.—FIBROID TUMOUR SHOWING MYXOMATOUS DEGENERATION. Multipara, aged 39. Isolated nuclei are seen persisting in many of the degeneration spaces.

*Cystic Degeneration: Fibro-cystic Tumours.*—Fibroid tumours become cystic only as the result of degenerative changes in their substance, necrobiosis and myxomatous degeneration being the most important processes which result in the formation of cystic spaces. Small spaces possessing an endothelial lining are sometimes met with, which represent dilated lymphatic channels, but they never attain a large size. Sometimes spaces containing a thin serous fluid differing greatly from the semi-gelatinous product of myxomatous degeneration, are found; they are probably the result of chronic œdema. Large cavities are always the result of degeneration, as is evidenced by their rough or ragged walls and the absence of an epithelial lining (figs. 118 and 119).

Subperitoneal fibroids are the most likely, and submucous ~~fibroids the least~~ likely, to become cystic, probably ~~owing to~~ the inferior vascularity of the former. Cystic fibroids may be met with at all ages, but their incidence falls chiefly upon women over forty years of age, and they are frequently met with after the climacteric period. The clinical features associated with cystic changes are variable; ~~pain is uncommon~~, menstruation is by no means always excessive, and its amount appears to depend more upon the position of the growth than upon the extent of the degenerative changes in it. Rapid increase in size is a constant feature; it is so rare for fibroids to grow quickly under ordinary conditions, ~~that rapid increase, apart from pregnancy~~, almost certainly indicates degenerative changes. This is especially true when the patient has reached or passed the age of the menopause.

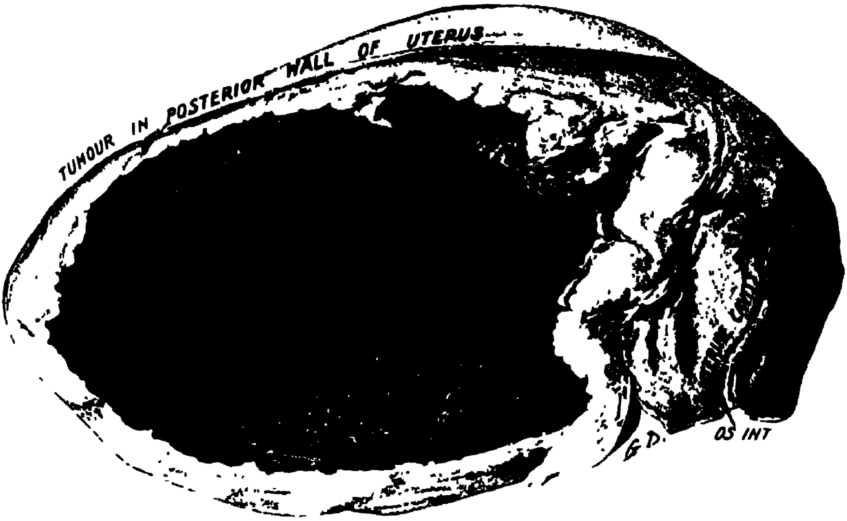

**Fig. 118.—Cystic Fibroid Tumour in the Posterior Uterine Wall.** Nullipara, aged 43. The large cavity with thick walls and rough nodular surface probably represents an advanced stage of necrobiosis. The contents were thick and chocolate coloured. Axial rotation through one quarter of a circle had occurred.

Cystic fibroids may attain an enormous size. The largest on record is probably that recorded by Severance, which is said to have weighed 195 lbs. (14 stone). In such very large tumours cavities of great size may be formed, and these, when situated anteriorly, yield the physical signs of a cyst, and so may lead to the erroneous diagnosis of an ovarian cystoma. When the cavities are of small size they render the consistence of the tumour soft and boggy (fig. 116), differing, on the one hand, from the hardness of an unaltered fibroid, and, on the other, from the elasticity of an ovarian cyst. Constitutional symptoms are rarely present, but sometimes these tumours

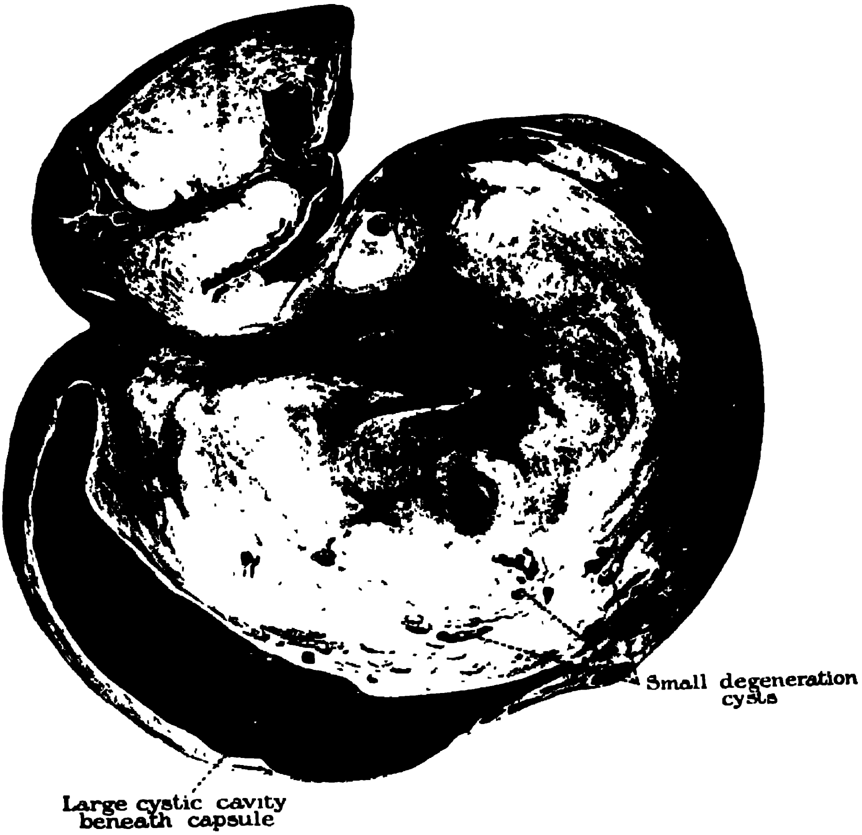

FIG. 119.—LARGE RETROPERITONEAL FIBROID TUMOUR; the same specimen as fig. 106. A large subcapsular cystic space has been formed in the lower part of the figure, and many smaller spaces in other parts.

appear to affect the general health adversely and sometimes give rise to slight fever.

**Circulatory Changes in Fibroid Tumours.**—*Œdema.*—Fibroid tumours in a condition of mucoid or myxomatous degeneration are frequently described as œdematous. This is incorrect, for the fluid of œdema is a serous transudation containing little albumen, whereas the fluid contained in these growths is rich in albumen and often coagulates spontaneously. Further, the microscopic evidences of cell degeneration previously described are always met with. True œdema, as an independent change, probably only occurs as the result of slight circulatory disturbances, due to compression from impaction of a fibroid in the pelvic cavity, or to axial rotation of the tumour. Small areas of œdema are, however, frequently found in company with other forms of degeneration.

*Axial Rotation.*—A stalked subperitoneal fibroid lying above the pelvic brim sometimes becomes twisted, i.e. rotates upon its axis; when the twist is extreme the uterus to which the tumour is attached sometimes participates in the rotation. Further, a uterus greatly enlarged by the presence of multiple sessile or interstitial fibroids sometimes becomes rotated *en masse*, the cervix forming for it a kind of pedicle, capable of being twisted to some extent. Axial rotation is an accident which occurs to ovarian tumours much more frequently than to fibroids, and the general considerations concerning its occurrence will be referred to later on in that connection (see p. 372). It may now be said, however, that pregnancy, which exerts a powerful predisposing influence in the case of ovarian tumours, appears to bear no relation to the occurrence of rotation in fibroids.

In the case of fibroid tumours rotation is usually partial only, for the thickness of the pedicle prevents the twist from completing more than half a circle. It is equally impossible for the uterus to become rotated through a complete circle, but even partial rotation may lead to occlusion of the cervical canal, and the accumulation of menstrual blood in the uterus (hæmatometra). Fibroids which have rotated become of a deep plum colour from congestion, and extensive interstitial hæmorrhage is found on microscopic examination. The tumour also, as a rule, contracts extensive adhesions to neighbouring organs. Occasionally the nutrition of the pedicle beyond the twist is greatly interfered with, atrophy occurs, and the tumour becomes detached from the uterus. It is then generally nourished through vascularisation of the adhesions which it has contracted; omental adhesions are the most important as sources of this alternative blood supply.

Acute symptoms similar to those which will be described in the case of ovarian tumours may be met with when fibroids become suddenly twisted. This is, however, exceptional; as a rule the rotation occurs gradually and the symptoms are inconsiderable, or may even be absent.

**Infection of Fibroid Tumours.**—When fibroid tumours become infected the endometrium is usually the channel of infection; from this it follows that submucous growths are the most liable, and subperitoneal growths the least liable, to become affected in this way. Another possible source of infection is the bowel, the fibroid being then attacked from its peritoneal surface. In very rare cases infection appears to occur through the blood.

Sometimes the whole of a large fibroid tumour, consisting of the uterus and several growths, becomes inflamed, resulting in the formation of general adhesions which may involve practically the whole of its peritoneal surface, and attach the tumour firmly to bowel, omentum, the uterine adnexa, and the parietal peritoneum. Coincident salpingo-oöphoritis is also always present. In such cases the uterus is probably attacked from both sides; from the endometrium by an infection which has ascended to the Fallopian tubes, and from the peritoneum by the pelvic peritonitis resulting from the tubal infection. In cases such as these pain and menorrhagia are prominent symptoms, but the existence of peritoneal adhesions alone does not always cause pain, and their presence may remain unsuspected until the abdomen has been opened. Instead of the whole tumour thus becoming infected, individual growths may be attacked, the infective process ending in suppuration or sloughing.

*Suppuration*, or the formation of an abscess in a fibroid growth, is very rare, but instances have been recorded both in interstitial growths (endometrial infection) and in subperitoneal growths (bowel infection). The abscess may become evacuated in the former case into the uterine cavity, in the latter through the bowel.

*Sloughing* occurs almost solely in connection with submucous or polypoid growths, the source of infection being a pre-existing purulent discharge, or in some cases operative interference or instrumentation, obstetric or gynaecological, of the uterine cavity. While the capsule of the tumour is intact sloughing probably does not occur; when the capsule has been torn, either in the natural process of extrusion of the tumour or by operative interference, infection is prone to lead to sloughing. In recent times this occurrence was not infrequently seen as a consequence of an intra-uterine operation formerly in vogue, in which the capsule of a submucous fibroid was either cut through or torn with the finger, and the tumour then left to await expulsion by natural processes; at the present time it is most commonly met with in connection with puerperal septic infection of the uterus. The processes of sloughing and extrusion go on together, and profuse irregular hæmorrhage often accompanies them. Fever, as a rule, is of moderate degree, for free drainage can take place through the cervix, rendered patulous by the uterine contractions which accompany the process of extrusion. Histological examination of expelled fragments of the growths is in these cases often inconclusive, for the staining reactions of the dead tissues are lost.

*Adhesions* are not commonly formed by fibroid tumours, and are much less frequent than is the case with tumours of the ovary. In Tracey's series of 3561 cases the tumour was found adherent in only 3·5 per cent. Adhesions occur under three different conditions: (1) Localised adhesions may form over an area which has undergone degeneration, the omentum being as a rule the organ to which the abnormal attachment is contracted; (2) General adhesions of the whole peritoneal surface of the tumour may occur from uterine infection; (3) Localised adhesions may be found in the neighbourhood of an extra-uterine source of infection, e.g. an inflamed Fallopian tube or ovary, the vermiform appendix, or a coil of intestine.

When adhesions are present the tumour seldom entirely loses its mobility, and their recognition before operation is a matter of difficulty. They do not in all cases cause pain, and except that they increase the operative difficulties of removal, they are not of great moment.

**Fibroid Tumours and Malignant Disease of the Uterus.**—The association of fibroids and malignant uterine growths may occur in three different forms: (1) Fibroid tumour with cancer of the cervix; (2) Fibroid tumour with cancer of the body; (3) Sarcomatous metaplasia of a fibroid tumour. In the first and second forms the fibroid and the carcinoma are independent diseases, cancer having attacked a uterus already the seat of a fibroid growth (fig. 120). In the third form it is believed that the tissue elements of the fibroid tumour become converted into, or replaced by, those of sarcoma.

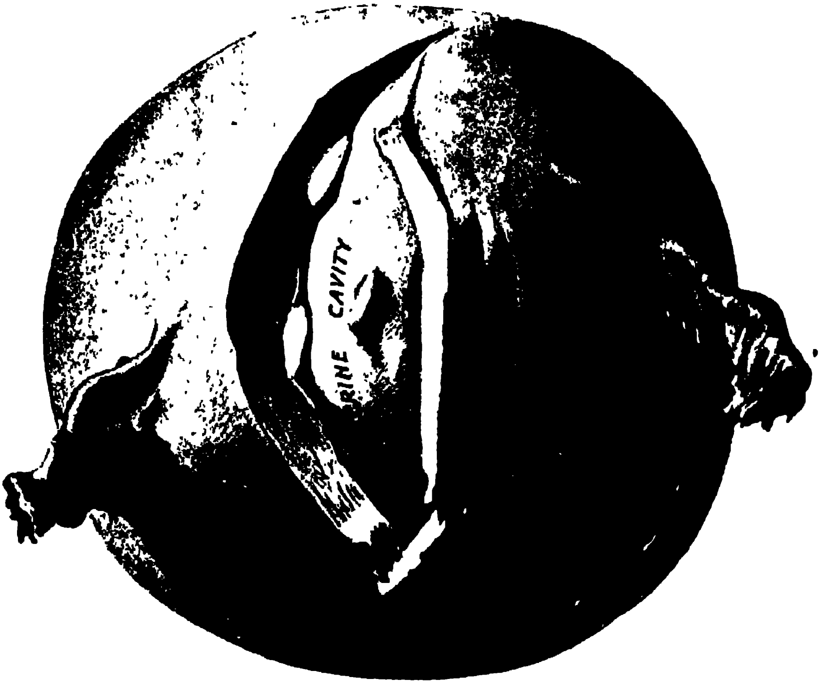

Fig. 120.—Interstitial Fibroid Tumour associated with Cancer of the Corporeal Endometrium. Multipara, aged 62. Three nodules of cancer are seen; two on the cut edge of the uterine wall, one on the wall of the uterine cavity. The uterus forms a large tumour of globular shape.

With regard to *cancer* it may definitely be stated that in three to four per cent. of cases of fibroid tumours removed by hysterectomy, carcinoma has been found, and with somewhat greater frequency in the body than in the cervix. Thus in 1400 cases Kelly and Cullen found cancer of the body in 1·78 per cent. and of the cervix in 1·28 per cent.; in 1118 cases Noble found cancer of the body in 2·4 per cent., and of the cervix in 1 per cent. Tracey in 3561 cases (collated) found cancer of the body in 1·7 per cent., cancer of the cervix in 0·7 per cent. In considering the subject of uterine cancer later on, it will be seen that this disease occurs with much greater relative frequency in the cervix than in the body; when associated with fibroid tumours the relative proportions are thus reversed.

The subjects of fibroid tumours are more frequently sterile than other women, and this fact in part accounts for the greater frequency with which, in these women, cancer occurs in the body than in the neck of the uterus.

With regard to *sarcoma* much less definite information is available owing to the histological difficulty of recognising sarcomatous tissues in a fibroid tumour. According to recent histological work, however, sarcomatous transformation is not very infrequent in fibroid tumours, which on naked-eye examination appeared to be innocent; Kelly and Cullen claim to have detected it in 1·21 per cent. of their cases, Noble found it in 1·8 per cent., and Tracey in 1·5 per cent. In most instances the sarcomatous area was small and situated towards the centre; it would have been overlooked if a systematic examination of the tumour had not been made.

Apart from direct microscopic evidence certain clinical data are well established which lend support to these considerations. Thus, after the removal of an apparently innocent fibroid tumour by hysterectomy, recurrence sometimes occurs, leading rapidly to a fatal termination. And again uterine polypi, regarded on removal as innocent fibroid growths, sometimes recur; in many such instances the original view was probably erroneous and the growth was a sarcoma from the outset. But this certainly is not the explanation in all cases. Thus Gessner has recorded a carefully observed case in which a polypus, originally fibroid, recurred four times, the fourth recurrence presenting the features of a vesicular sarcoma.

These clinical and histological data sufficiently establish the view that a sarcomatous transformation of a fibroid tumour may, and does, sometimes occur. The subject will be again referred to in connection with sarcoma of the uterus.

The association of malignant disease and fibroids is rarely, if ever, seen before the age of forty. The view has been advanced that the figures already given lead to the conclusion that the subjects of fibroid tumours are more liable than other women to the development of cancer in later middle age. It is doubtful if this conclusion is justified; it must be recollected that the statistics are compiled only from cases submitted to the operation of hysterectomy, i.e. from only a proportion of the total number of women in whom fibroids occur. If it were possible to calculate the association of cancer with fibroids generally, and not alone with cases operated upon, the aspect of the matter would probably be greatly changed.

A small number of cases have been recorded in which cancer was recognised in the cervical stump left after the operation of supra-vaginal amputation for a fibroid tumour In several of these cases it appears that the malignant disease was present at the time of the operation, but was not then recognised. It is possible that this explanation applies to them all. In any case, this occurrence cannot be held to imply any special liability of the cervical stump to become cancerous.

The *diagnosis* of malignant changes in fibroid tumours, or of the concurrent formation of a malignant growth in the uterine body, can seldom be made before the removal of the tumour. The possibility of malignancy must, however, always be entertained under the following circumstances:

1. When the tumour enlarges after the menopause is over.
2. When bleeding returns after the menopause is over.
3. When ascites, anæmia, or wasting appear.
4. When after the age of forty, the tumour is soft in consistence and grows rapidly.
5. When recurrence takes place, e.g. after the removal of a polypus.

Under these circumstances the removal of the tumour should not be delayed.

## FIBROIDS AND PREGNANCY

Conception does not readily occur in a uterus which is the seat of a fibroid tumour when that tumour is submucous or interstitial in position, whether it is small or large. Subperitoneal fibroids, however, are probably no hindrance to conception, whatever their size may be. And although the first-named varieties are a hindrance to conception they by no means absolutely prevent it, so that the association of fibroids with pregnancy is not uncommonly met with.

*The Diagnosis of Pregnancy* in a uterus enlarged and distorted by the presence of one or more fibroid tumours may present great difficulties. The degree of difficulty will depend in the main upon the position of the uterine cavity and its relation to the tumour or tumours. Sometimes the cavity is anterior and accessible to abdominal palpation, when diagnosis will be comparatively easy; but it may lie behind the tumour which intervenes between it and the abdominal wall; or it may be placed between two tumours, when diagnosis will be very difficult. Until the presence of the fœtus can be directly detected by palpation or by auscultation of the heart, the diagnosis of pregnancy can only be presumptive. During the first five months the greatest importance must be attached to amenorrhœa; sudden cessation of the menses in a patient with a fibroid tumour almost invariably implies pregnancy, unless the age of the menopause has been reached. But not infrequently irregular hæmorrhage takes the place of amenorrhœa, and this symptom frequently occurs in connection with fibroids from other causes. Signs of activity in the breasts carry, perhaps, less than their usual importance in these cases, because secretion is sometimes found in the breasts of nulliparous, non-pregnant women who are the subjects of uterine fibroids. Pregnancy causes rapid enlargement with softening of the uterus and, to a less extent, of the tumours which it contains. Owing to the distortion caused by the new growths, the alterations in shape characteristic of the early months of pregnancy cannot be made out, while softening of the cervix is usually late in appearing. A uterine souffle can often be heard over some parts of a non-gravid fibroid uterus, so that the presence of this sign also is unimportant. It will thus be readily seen that diagnosis must be difficult at this stage of pregnancy; repeated examinations will be required, and even then it may be necessary to postpone diagnosis until the period at which the fœtal heart can be heard.

During the later months the gravid part of the uterus may be found to occupy almost any position with regard to the tumour; usually it is placed more or less laterally, but may be in the upper or lower portions of the mass. Upon its position will depend the degree of ease with which the fœtal heart or limbs can be detected.

*Clinical Course.*—Pregnancy certainly causes recognisable softening of fibroid tumours, but opinions differ as to whether it causes their rate of growth to increase, and the truth is not easy to establish. Upon the general course of pregnancy and the development of the fœtus, fibroids exert no unfavourable influence, unless some complication should arise. A fibroid tumour impacted in the pelvis may cause severe pressure symptoms as the uterus develops, but these effects are due to the accident of its position. Axial rotation of a stalked subperitoneal fibroid may occur, though very rarely, during pregnancy; and previously existing adhesions may become troublesome through being stretched. The statement sometimes made that subjects of fibroid tumours are in peril of their lives when pregnant is wrong, for in the majority of cases the course of pregnancy is not attended by serious complications. There is, however, undoubtedly, a somewhat greater risk of pregnancy ending prematurely either in abortion or premature labour.

*Management.*—Pregnancy should be allowed to continue until term, unless (1) severe complications due to the tumour arise, or (2) the tumour is so situated as inevitably to cause insuperable obstruction during labour. In the former case the offending tumour should, if possible, be removed by myomectomy and the uterus allowed to remain; this operation is followed by spontaneous abortion in about 50 per cent. of cases. In the latter case there are two possible alternatives: (*a*) abortion may be at once induced; (*b*) the pregnancy may be allowed to continue until term, and the child then delivered by Cæsarean section, the uterus being at the same time removed. The induction of abortion *cannot be recommended ; the position of the fibroid tumour necessarily renders dilatation of the cervix difficult, and if* interference is necessitated to evacuate the uterus, serious mechanical obstacles may have to be overcome. Cæsarean hysterectomy at or near term is no more serious than hysterectomy at an earlier period, when the fœtus is non-viable, and is therefore, on the whole, the best method of dealing with such cases

## GENERAL COURSE AND DURATION OF FIBROID TUMOURS

As a rule fibroid tumours grow slowly and produce their ill effects by very gradual stages. After a period of steady growth they may become quiescent and remain stationary for prolonged periods extending, it may be, over many years. In these respects they greatly differ from the common kinds of ovarian cystic tumours. In many cases tumours of considerable size may be observed to enlarge definitely during the few days preceding a menstrual period, and again to shrink when it is over. Progressive reduction in size may also occur after the menopause, but, as already mentioned, this is quite exceptional.

Rapid increase in size in the absence of pregnancy is almost invariably due to degenerative changes in the tumour itself. Softening in consistence always accompanies rapid increase in size. Pregnancy and the approach of the menopause exert a powerful influence, predisposing to degenerative changes. Apparent increase in size with softening may, by operation, be shown to arise from the coincident growth of an ovarian cyst, or from distension of the Fallopian tubes. The clinically harder kinds of fibroid tumours are less likely than the softer ones to undergo variation, or to increase rapidly in size.

Exacerbation of symptoms, such as hæmorrhage, may be due to natural changes, such as extrusion of submucous growths, or less often, to degenerative or malignant changes. Sudden onset of pain, or increase of pre-existent pain, may be due to infection, to axial rotation, or to the occurrence of inflammatory changes in the Fallopian tubes and ovaries.

Occasionally intermittent complications directly due to the *fibroid tumours may arise; thus cases of fatal intestinal obstruction due to a fibroid tumour have been recorded by* Cullingworth and others; and instances of chronic renal disease due to pressure on the ureters are sometimes met with.

## TREATMENT OF FIBROID TUMOURS

There are no means known by which the formation of fibroid tumours can be prevented, or their subsequent growth controlled. Medical and therapeutic measures may be successful in palliating the symptoms to which they give rise; cure can only be obtained by surgical measures, such as the removal either of the tumours alone, or of the tumours together with the containing uterus.

Not all fibroids require treatment; unless symptoms clearly attributable to their presence are met with no treatment need be adopted, and in many cases it is better that the patient should not be informed of the existence of the tumour. When definite symptoms requiring relief are present, the decision must first be made between medical (symptomatic) and surgical treatment. It must be recognised that considerable difference of opinion exists upon this matter, and no individual view would meet with universal acceptance. The results of palliative treatment are uncertain and on the whole unsatisfactory, although an occasional success may be met with. No harm is done, however, by giving this treatment a trial when the patient is under forty years of age, and the symptoms are not severe. It should be borne in mind that the remote results of removing the uterus, as regards the general health, are more serious in young women than in those who are approaching the age of the menopause.

Under the following conditions it is better that surgical treatment should not be delayed:

(*a*) When the tumour is increasing rapidly in size, and is accompanied by pain.

(*b*) When a fibroid which has been quiescent, becomes troublesome in any way after the menopause.

(*c*) When palliative treatment fails to control bleeding, and there is advancing anæmia.

(*a*) This almost always signifies that secondary changes have occurred in the tumour, and medical treatment is then useless. (*b*) The same explanation applies, with the added risk of the possibility of the advent of malignant disease. (*c*) The general systemic results of chronic anæmia are sufficiently serious to demand the arrest of the loss of blood by whatever measures are necessary.

When menorrhagia is the only symptom caused by a fibroid tumour, rest in bed during the monthly period is sometimes sufficient to reduce the flow to moderate limits, within which it does no harm. Over-exertion or chill during menstruation may occasion a violent or protracted hæmorrhage. The uterine hæmostatic drugs mentioned on p. 113 may also be given with advantage.

**Symptomatic Treatment.**—*Hæmorrhage* and *anæmia* are interdependent conditions, and both must be treated if success is to be attained.

The immediate treatment of uterine hæmorrhage has been already described on p. 112; it only remains in this place to indicate that in cases of bleeding from fibroid tumours preparations of ergot are seldom successful, unless given in full doses by the hypodermic method; and further, that bleeding of the most severe type can always be temporarily controlled by plugging the vagina. In these cases the uterine cavity also can sometimes be plugged in an emergency as the cervical canal is patulous, but the greatest care is required to avoid infection if this method is employed.

After a severe hæmorrhage the patient should be kept in bed and treatment directed to the resulting anæmia. Iron in some of its milder forms, hæmoglobin, bone marrow, raw meat juice, and a liberal supply of milk, are the more important items in the treatment. The ability of different persons to recover from large losses of blood is variable; many women appear to suffer little and recover rapidly; others do not properly recover even when treated in the manner just indicated, and successive hæmorrhages in already anæmic patients become more and more difficult to control.

*Pain and Pressure Symptoms.*—Pain may be due to secondary changes in the tumour, such as inflammation, or to pressure upon other viscera or upon nerves. Relief can be obtained by rest in bed, but treatment at a spa in this case gives the best results ; such treatment consists in the consumption of large quantities of mineral water, aided by prolonged hot baths and hot vaginal douches, combined with the use of massage and electricity. In this country Woodhall Spa, in Germany Ems and Schwalbach, in Austria Franzensbad and Marienbad, in Italy Salzo-Maggiore, are suitable for cases of fibroid tumour. A course of this treatment repeated regularly once or twice a year may succeed in deferring a resort to surgical measures for a long time, or in fortunate cases permanently.

Pressure upon the bladder, causing frequency of micturition, incontinence or retention, is most often met with in connection with menstruation—either during or immediately before the period, and is probably due to a slight increase in the size of the tumour from congestion. Under these circumstances retention requires the regular use of the catheter until in the natural course the tumour diminishes in size, the pressure is relieved, and the bladder recovers. Retention occurring in the menstrual intervals can also be temporarily relieved by rest in bed and the catheter. In a few fortunate cases it may be possible to give more permanent relief by pushing the tumour out of the pelvis and above the pelvic brim, under anæsthesia if necessary. The vagina should then be plugged and the plugging renewed daily for two or three days, to prevent the tumour from returning to its pelvic position. Pessaries in such cases are incapable of keeping up the enlarged and heavy uterus. A small fibroid tumour in a prolapsed uterus causing bladder symptoms may be successfully treated by a pessary, if the condition of the perineum allows of the instrument being retained.

The use of electricity, of X-rays, and of radium in the treatment of fibroid tumours has hitherto not yielded results which justify their recommendation. The employment of intra-uterine electrodes has been known to cause ulceration, and sometimes perforation, of the uterine wall at points of contact.

**Surgical Treatment.**—*Curetting.*—This operation is sometimes useful in producing a temporary alleviation of hæmorrhage ; this result cannot, however, be relied upon, and as a rule the operation is unsuccessful. It is only suitable for tumours of small size; in large tumours the uterine cavity is so frequently distorted in shape that curetting is impossible (fig. 111). The cervix should be dilated sufficiently to admit of preliminary exploration with the finger, as small polypoid or submucous growths may then also be detected and removed. Dilatation is sometimes very difficult when fibroid tumours are present, owing to the density of the cervical tissues.

2. *Myomectomy.*—This procedure (cutting the tumour out of the uterus) is the operation of choice in the case of solitary tumours occurring in young women, when the conservation of the uterus itself is desirable. The operation may also be applied to multiple subserous tumours whether pediculated or sessile. Tumours of large size may be successfully dealt with in this way. In the case of women of forty-five years of age or over the retention of the uterus is unimportant.

The advantage of myomectomy is that, the uterus being retained, menstruation continues and pregnancy may occur; the disadvantage is that fresh fibroid tumours may subsequently form. In only a small proportion of cases does pregnancy actually occur after this operation, for women who are subjects of these tumours show also a low degree of fertility. It must also be borne in mind that after the abdomen has been opened and the tumour has been carefully inspected, local conditions may be found which preclude myomectomy and necessitate removal of the uterus. When this operation is undertaken it is accordingly advisable to secure permission to remove the uterus if this should be found necessary.

3. *Hysterectomy* by the supra-vaginal or subtotal method, with conservation of the ovaries when healthy, is the operation which will be found most generally useful. The artificial menopause which follows this operation is not, as a rule, more severe than that which occurs naturally. If both ovaries are removed as well as the tumour, and the patient is under forty years of age, the climacteric symptoms are often severe and prolonged.

These operations will be described on p. 548.

## UTERINE POLYPI

Two kinds of polypi are common in the uterus, *mucous* or *adenomatous* polypi and *fibroid* polypi. The former have their seat of election in the lower part of the cervical canal near the os externum, but may also occur in the uterine body. The latter, on the contrary, have their seat of election in the body, but occasionally occur in the cervix. Polypi which combine the characters of both kinds (*fibro-adenomatous*) are not uncommon in the cervix.

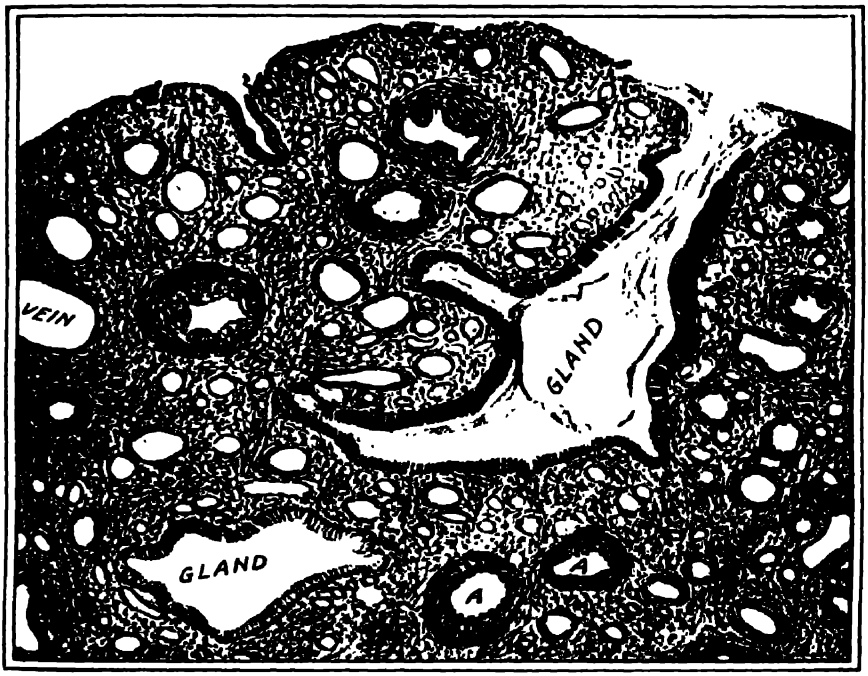

Fig. 121.—Mucous Polypus of the Cervix. The stroma is very vascular and shows numerous large arteries with thickened walls and also many veins.

**Mucous** or **adenomatous** polypi are small, soft, pediculated structures which are usually multiple, and of the average size of a pea, although they may sometimes attain the size of a cherry or even of a walnut. As seen at the mouth of the cervical canal they are of a light pinkish or red colour, and are attached either to an area of erosion, or to the cervical endometrium within the canal. By their colour they are sharply distinguished from the vaginal mucosa. Though usually solitary they may occur in groups of two or three. When occurring in the corporeal endometrium they are usually not discovered until removed by the curette. In fig. 124 is shown a mucous polypus attached to the lateral border of the uterus which escaped removal, although the operation of curetting was twice performed. Endometritis, both cervical and corporeal, and cervical erosion are common accompaniments of mucous polypi.

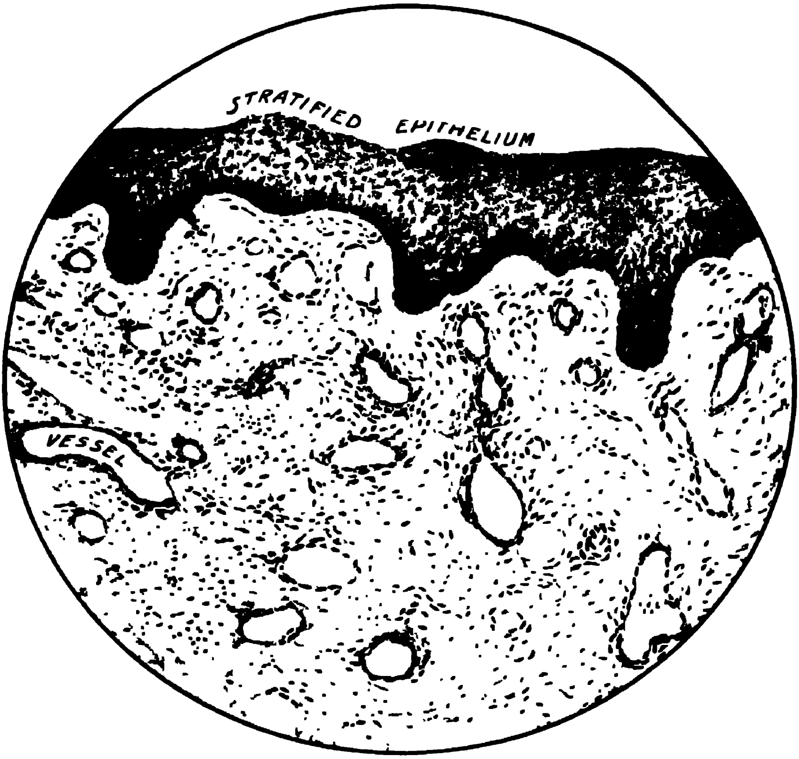

FIG. 122.—FIBRO-ADENOMATOUS CERVICAL POLYPUS. The epithelial covering consists of a thick layer of stratified squamous epithelium like that found on the vaginal wall. The stroma consists of very vascular fibrous tissue.

On histological examination they are seen to consist of a connective tissue stroma of loose texture supporting numerous glands, some of which open upon the surface, others have become dilated and form small retention cysts (fig. 121). These glands are lined with cylindrical epithelium similar to that of the endometrium. The stroma is extremely vascular, the microscopic field showing a large number of

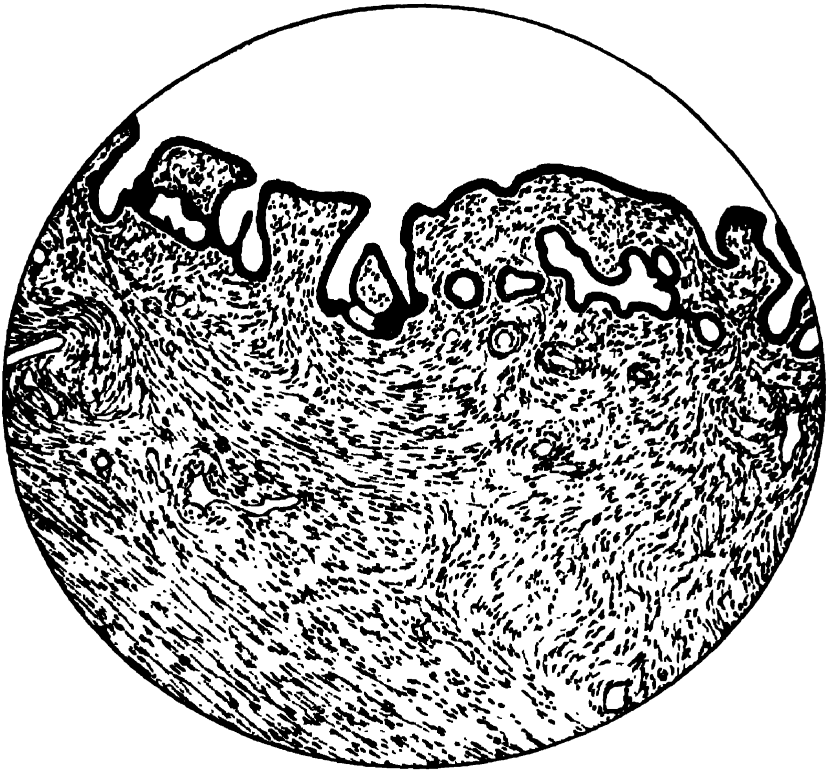

FIG. 123.—FIBRO-ADENOMATOUS CERVICAL POLYPUS. From the same specimen as fig. 122. The surface is papillomatous and covered completely with a single layer of columnar epithelium. The stroma consists of vascular fibrous tissue.

vessels, both arterial and venous, the former frequently show also thickening of their outer and middle coats (endarteritis). Some of the thin-walled vessels seen in fig. 121 may be dilated lymphatics, the majority are veins of large calibre. The surface of a cervical mucous polypus somewhat resembles that of an erosion (compare fig. 92); it has an incomplete epithelial covering of cylindrical cells, chiefly found in the neighbourhood of the mouths of the glands. The firmer fibroid or fibro-adenomatous polypi often have a covering of well-developed stratified squamous epithelium like that of the vaginal mucosa; and sometimes the surface of the same polypus may show cylindrical epithelium in one part and stratified squamous epithelium in another (see figs. 122 and 123). Parts of the surface covered with squamous epithelium are smooth, parts covered with cylindrical epithelium are velvety in texture.

Two symptoms are commonly associated with mucous polypi, viz. hæmorrhage and leucorrhœa; it will be recollected that the same symptoms are often caused by chronic endometritis. Profuse or protracted monthly loss results from intra-uterine (usually fibroid) polypi, and irregular or prolonged slight bleeding from cervical (usually mucous) polypi; often both types of bleeding are met with in severe cases. A mucous polypus of small size sometimes causes hæmorrhage so severe as to endanger life.

The *diagnosis* of cervical polypi is very simple, for they can be felt with the examining finger and inspected with the aid of a speculum. Intra-uterine polypi can only be detected by exploring the uterus with the finger, or by the use of the curette. All polypi should be submitted to careful histological examination, for apparently innocent growths may eventually prove to be sarcomata (see below).

The *treatment* of cervical polypi is to seize them with forceps, crush, and then twist them off by tearing through the pedicle. Small ones may be destroyed by the actual cautery. It is well at the same time to curette the uterus, as chronic endometritis so frequently accompanies mucous polypi.

**Fibroid polypi** have been described in the section dealing with fibroid tumours of the uterus (p. 230).

**Placental polypi** are a sequence of incomplete abortion, or of retention of a piece of placenta after labour. Hæmorrhage occurs from partial separation of the retained structures, or from imperfect uterine retraction. Coagulation of effused blood takes place upon the surface, and gradually the mass grows by accretion, until it may fill the uterine cavity, and project at the external os. These polypi are always single.

**Malignant polypi** are usually sarcomatous. In such cases the malignant character of the growth may not at first be apparent, it being regarded as a fibroid polypus. Recurrence takes place after removal and apparently a change in histological characters may occur, for cases have been described by competent observers in which, while the first polypus removed was fibroid, the recurrence was definitely sarcomatous. This point will be again referred to in connection with sarcoma of the uterus.

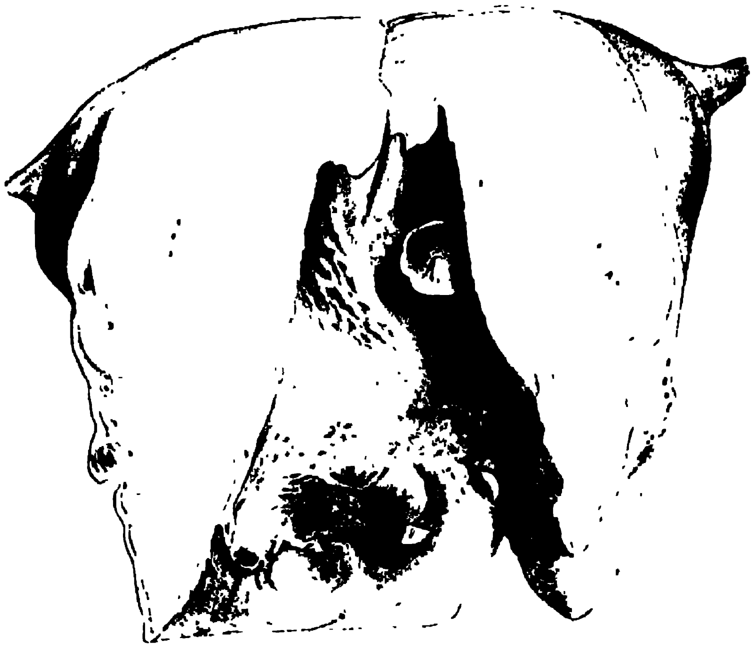

Fig. 124.—Mucous Polypus of the Endometrium in a Fibrotic Uterus. The fibro-muscular wall of the uterus is greatly thickened (Charing Cross Hospital Museum).

*Diagnosis of an Intra-uterine Polypus.*—In all cases of severe hæmorrhage, whether menstrual or irregular, for which there is no obvious cause in the cervix or vagina, the possibility of a polypus in the uterine cavity must be considered. Small mucous polpyi occasion only slight enlargement of the uterus, of the same character as that found in chronic endometritis. Fibroid polypi are always large enough to cause considerable increase in the size of the uterus, and in some cases it may be felt to be as large as a cricket ball. Usually it is globular in shape, and its walls are smooth, unless other interstitial or subserous fibroid growths are also present.

In consistence the uterus is harder than normal. Bimanual examination may set up considerable hæmorrhage. The sound gives a long measurement in these cases, unless its passage is checked by the polypus; sometimes the tip of the sound may be felt to impinge upon the polypus and then slip past it. Usually, however, the sound fails to elicit definite signs of its presence. If the internal os is open the polypus may be seen, or felt by the finger.

In the great majority of cases the diagnosis can only be made by dilating the cervix and then exploring the uterine cavity with the finger. Fibroid polypi feel firm and smooth, and do not bleed severely when touched; placental and malignant polypi are soft and friable, and may bleed profusely under examination. The placental polypus can be readily detached with the finger, leaving the uterine wall smooth; further, it is associated with a history of hæmorrhage dating from an antecedent miscarriage or labour.

It is of great practical importance that all uterine polypi removed by operation should be examined histologically. Apparently innocent growths may prove to be malignant, as has been already mentioned.

The *treatment* of an intra-uterine polypus is to remove it, after first dilating the cervix, unless this has been already effected by the polypus.

## MALIGNANT GROWTHS OF THE UTERUS

The following varieties of malignant tumours occur in the uterus: carcinoma, sarcoma, endo- and peri-thelioma and chorion-epithelioma; their relative frequency corresponds roughly with the order stated, but carcinoma is more frequently met with than all the others taken together. Two organs in the female sex show a greater predisposition to cancer than any others, viz. the breast and the uterus, the liability of these two being about equal. From a study of the cancer statistics of large clinics it appears that, in women affected by cancer, the organ primarily attacked is the uterus in about 30 per cent. of all cases (Welch, Orth). In the present unsettled state of knowledge of the causation of cancer, little can be said in explanation of this special predisposition of the uterus, but this point will be again referred to in connection with cervical cancer. Cancer may attack either the cervix or the body of the uterus, but seldom are both divisions affected in a single case. The cervix is much more frequently attacked than the body, but it is very difficult to define with accuracy the relative frequency of the two. From a study of post-mortem statistics it would appear that 95 per cent. of cases of uterine cancer are cervical, and only 5 per cent. corporeal. Clinical statistics give a higher proportion of cases of corporeal cancer than this, but it must be recollected that many inoperable cases of cervical cancer do not come under hospital treatment at all, and it is therefore probable that, as regards the actual incidence of the disease, not more than 5 to 6 per cent. of cases are corporeal.

Cervical and corporeal cancer present so many points of anatomical and clinical difference, that they are entitled to consideration as distinct diseases.

## CANCER OF THE CERVIX

**Pathological Anatomy.**—Cancer may arise in the cervix in two different positions: (*a*) on the surface of the portio vaginalis; (*b*) in the cervical endometrium, i.e. the mucous membrane lining the cervical canal. The anatomical features of the disease are different, as it occurs in the one or the other situation, and it is convenient to distinguish them as (*a*) *cervical cancer*; (*b*) *endocervical cancer*. The former is of much more frequent occurrence than the latter.

(*a*) *Cervical cancer* arises in the area indicated in fig. 125. It most commonly begins close to the os externum. In the normal cervix it is at this spot that the stratified squamous epithelium covering the vaginal portion meets the columnar epithelium of the cervical endometrium. Sometimes in a healthy cervix the point of junction of the two kinds of epithelium lies just within the cervical canal; in cases of erosion or ectropion, on the other hand, the point of junction is upon the exposed surface of the cervix. It will also be remembered that the cervical endometrium possesses numerous glands which penetrate the musculature, and an erosion shows practically the same structure as the mucous membrane. It is therefore clear that cancer in this situation may arise either in the squamous epithelium, giving rise to *squamous-celled cancer* or *epithelioma*; or in columnar epithelium of the glandular type, giving rise to *adeno-carcinoma*. These two varieties of cervical cancer closely resemble one another as regards their clinical characters and naked-eye appearances; sometimes difficulty arises even in distinguishing them by histological examination. Owing to the close resemblance of their general characters it is unnecessary to consider the two varieties separately. Pathological reports upon large series of cases show that from 75 per cent. to 80 per cent. of all cases of cervical cancer are of the squamous-celled variety.

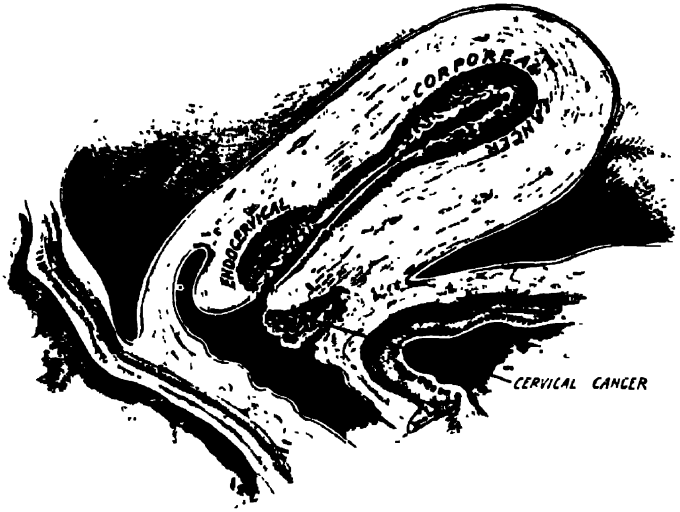

FIG. 125.—CANCER OF THE UTERUS (diagrammatic), showing the positions in which the disease may arise.

Opportunities of observing the earliest stages of cancer of the cervix are rare, but it is known to occur in two forms: (1) as a small, hard, raised nodule or patch; (2) as a shallow indurated ulcer. In both forms the tissues are friable to the finger-nail, and bleed easily. The disease may affect either the anterior or posterior lip, and it usually begins close to the external os. As the disease progresses the appearances vary: (1) large masses of new growth are gradually formed which project into the vagina, and comparatively little tissue destruction occurs; (2) ulceration or tissue destruction proceeds *pari passu* with new formation and invasion of surrounding parts, the result being the formation of a rough-walled cavity in the position of the cervix. The former is known as the *formative* or *proliferative* type; the latter as the *ulcerative* or *eroding* type.

An early example of the proliferative form is seen in fig. 126; the cervix shows an extensive puerperal laceration which has cicatrised irregularly, and near the cervical margin is a nodule of new growth which has also spread to the opposite side of the cervix. A more advanced specimen of the same form of the disease is seen in fig. 127, which shows nodular masses of new growth surrounding the external os; the surface of these masses is uneven and divided by irregular shallow sulci after the manner of a papilloma, and giving somewhat the general contour of a cauliflower. Such growths as these sometimes attain very large size, distend the entire vaginal canal, and present at the vulva. In other instances a formative cancer presents a broad,

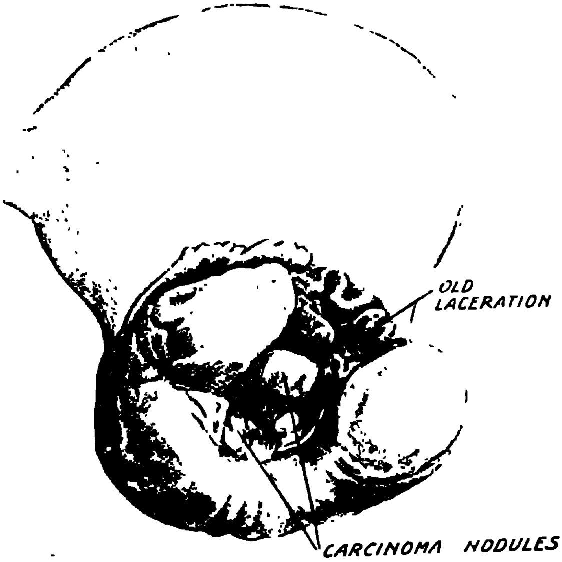

FIG. 126.—CARCINOMA OF THE CERVIX, multipara (Charing Cross Hospital Museum). The disease is in the early stage and has arisen just within the lips of the os externum.

smooth, dome-shaped surface, which has been likened to a mushroom.

An advanced instance of the *ulcerative* type is seen in fig. 128; the cervix has disappeared, and in its place a large ragged cavity is seen extending upwards towards the body of the uterus, which in the specimen has been laid open. From the size of this cavity it is evident that the disease has passed the limits of the cervix, involved the vaginal walls, and encroached upon the surrounding tissues. This variety of cervical cancer is the result of ulceration of the ill-nourished or degenerating tissues of the new growth; infection is often superadded and may arise spontaneously from vaginal organisms, or may result from the introduction of organisms from without by digital examination, use of instruments, coitus, etc.

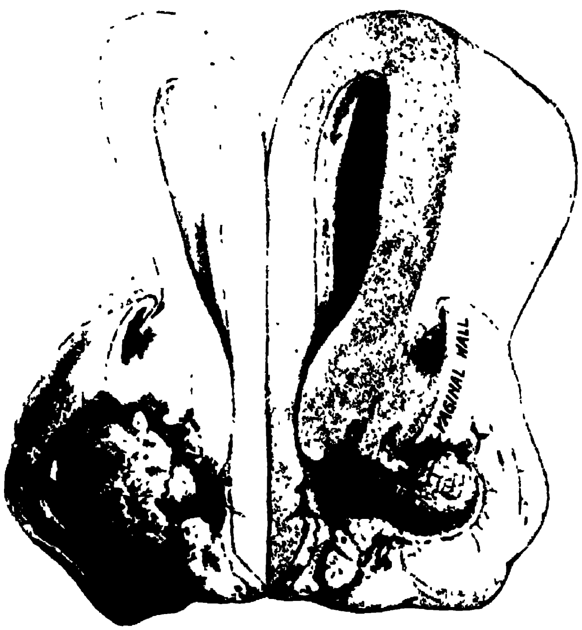

Fig. 127.—Carcinoma of the Cervix: proliferative form (Charing Cross Hospital Museum). The whole of the vaginal cervix is occupied by an irregular papillary growth. Uterus bisected in sagittal section.

(*b*) *Endocervical Cancer.*—Cancer beginning in the cervical canal is inaccessible to direct observation, and less is known of the earliest stages than in the case of cervical cancer. A fairly advanced stage of the disease is shown in fig. 129; the surface of the portio vaginalis is unaffected, but the whole of the substance of the cervix is infiltrated with new growth up to the level of the internal os, where it ceases abruptly. Ulceration has occurred in the central part of the canal, producing a globular cavity with ragged walls, the cervical canal above and below being much narrower. In advanced cases a large ragged cavity may be formed in place of the cervical

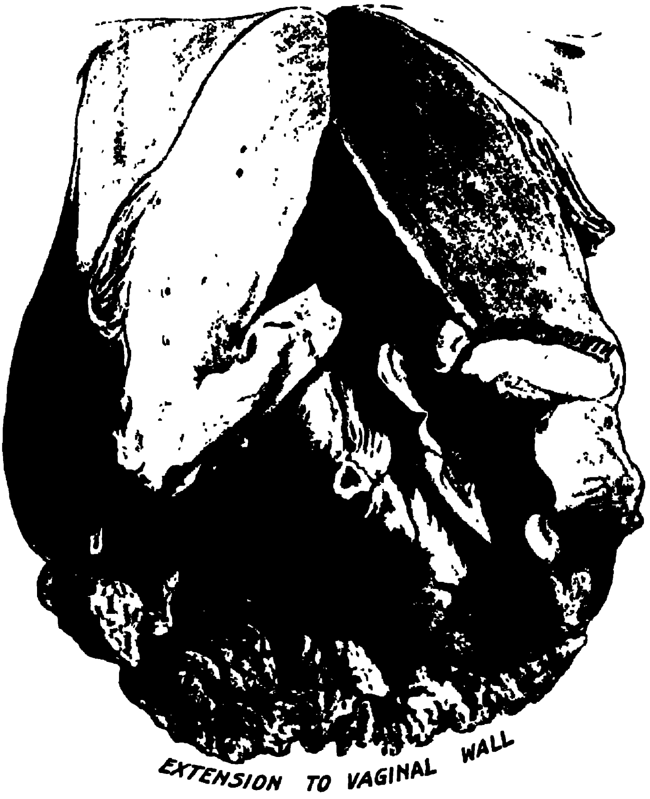

FIG. 128.—ADVANCED CARCINOMA OF THE CERVIX: ULCERATIVE TYPE. The vaginal cervix has disappeared, being replaced by an irregular cavity with ragged walls; the growth has extended on to the vaginal wall below and to the level of the internal os above.

canal, equal in size to the body cavity. On clinical examination in the earlier stages only the increase in volume of the supra-vaginal cervix, its hardness and fixation, can be observed. Although the disease seldom passes the limits of the cervix in an upward or downward direction, the paracervical cellular tissue is soon involved, by direct continuity, in the advancing growth.

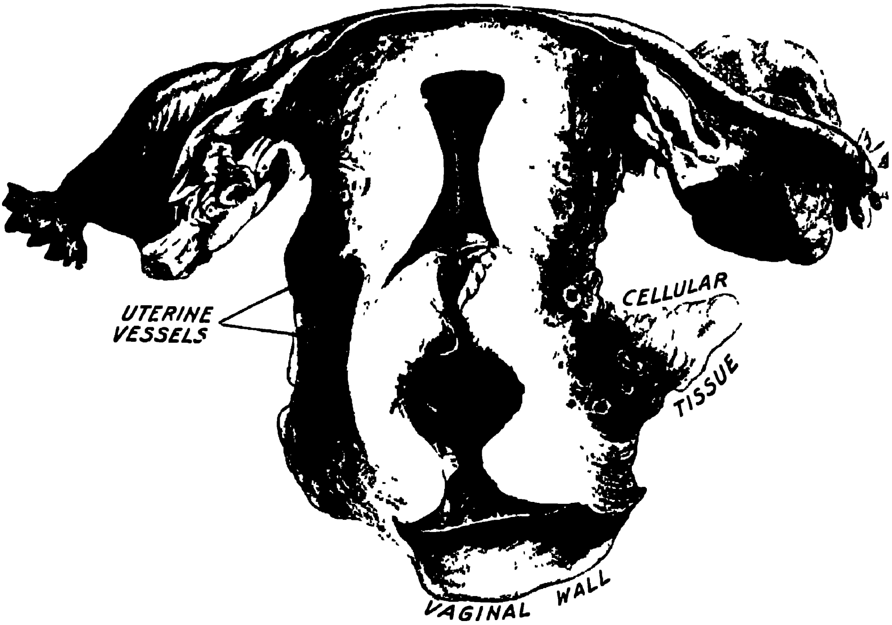

FIG. 129.—ENDOCERVICAL CARCINOMA. Multipara, aged 54. The vaginal portion of the cervix is atrophied; the supra-vaginal cervix is the seat of the disease, the central cavity representing the oldest part. The disease has not spread visibly beyond the limits of the cervix.

As there is no stratified epithelium in the cervical endometrium, endocervical cancer is always of the adenocarcinomatous type, and probably begins in the deeper portions of the glands.

**Microscopic Appearances of Cancer of the Cervix.**—*Squamous-celled Cancer.*—The characteristic appearances are only to be found at the advancing edges of the growth, and sections required for diagnosis should always be taken from this part. It has been pointed out that from the deep layers of the stratified epithelial covering of the cervix, shallow digitate processes project into the subjacent connective tissue layers (fig. 93). Cut in transverse section these processes appear under the microscope as small islets of epithelial cells uniform in character, surrounded by connective tissue from which they are sharply differentiated. In squamous-celled cancer the new growth

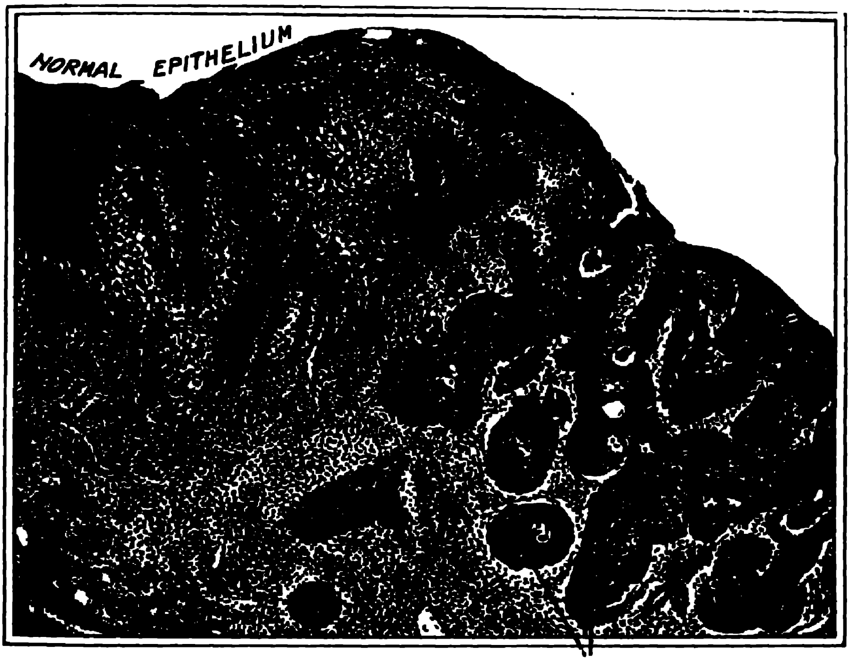

FIG. 130.—SQUAMOUS-CELLED CANCER OF THE CERVIX. Multipara, aged 27. The section is made through the edge of the growth. At *a* are seen two epithelial processes, one in cross section, the other running up to the surface.

is formed from the deep layers by the production of large, branching, solid (fig. 130), epithelial processes which penetrate the healthy tissues deeply and destroy them in their advance. In transverse section they appear as masses of epithelium of various shapes and sizes, more or less sharply bounded by a well-defined fibro-muscular stroma, representing the normal tissues of the cervical wall. In these masses the peripheral layer of cells is cubical; passing towards the centre the cells are more irregular and tend to become polygonal. In the central parts may often be seen a small area of flattened cells arranged concentrically, the so-called *epithelial pearls* (fig. 131), but these structures are not so numerous nor so well formed as in squamous-celled cancers of other organs. Near the cancer areas the stroma often shows a certain amount of round-celled infiltration and œdema, and the cancer cells may be seen escaping into, and invading, the connective tissues.

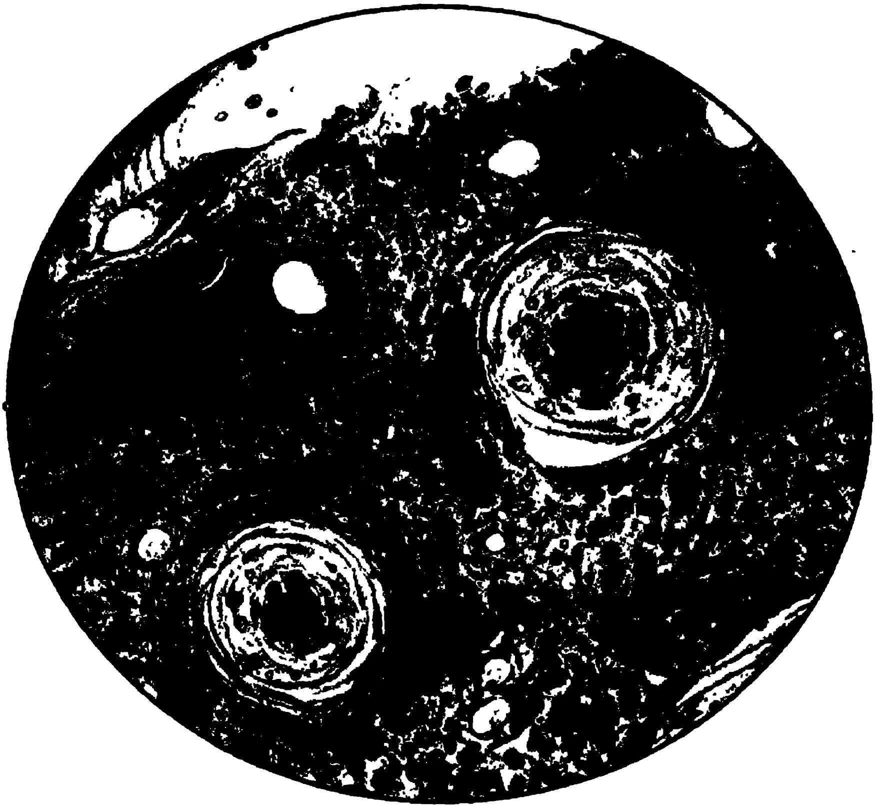

FIG. 131.—SQUAMOUS-CELLED CARCINOMA OF THE CERVIX. Two epithelial pearls (cell nests) are seen in the section. The surrounding tissue consists mainly of cancer cells.

In the more advanced portions of the growth the fibro-muscular stroma is not seen; the cancer cells become more widely disseminated and penetrate the surrounding tissues, destroying them in their advance, so that large areas of the growth consist of little else but masses of cancer cells.

These parts of the tumour are prone to undergo ulceration; the characteristic appearances are then lost and an extensive zone of round-celled infiltration is found around them (fig. 132). The surface of a squamous-celled cancer usually displays these modifications, except at the edges where the appearances remain characteristic. Here it is often seen that the cancer has penetrated the stroma beyond the apparent edge of the growth, passing into parts which are still covered by normal squamous epithelium (fig. 132).

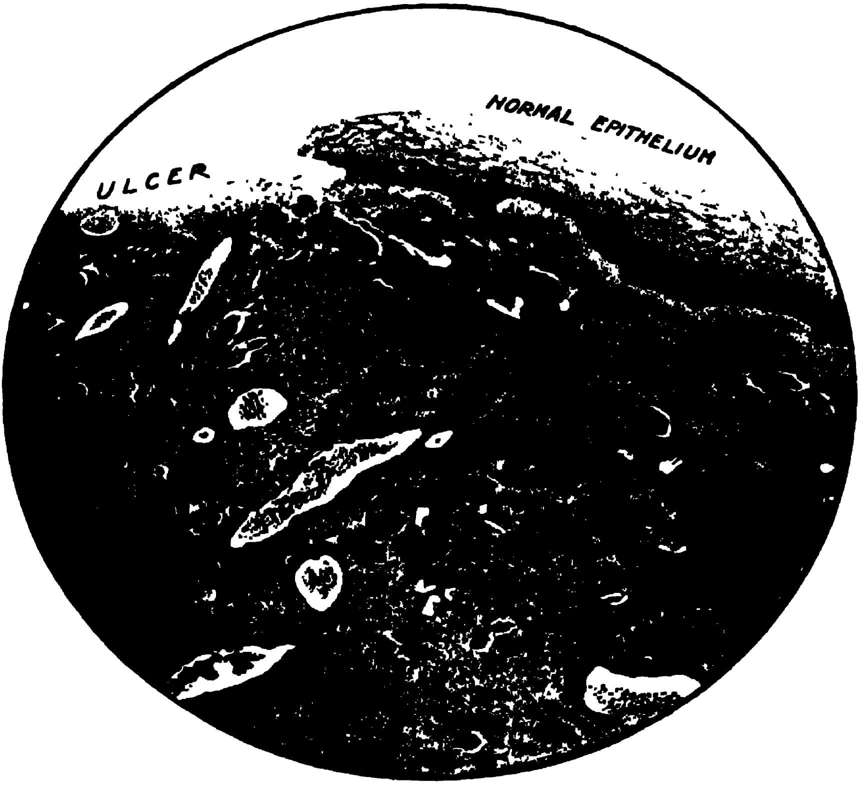

FIG. 132.—SQUAMOUS-CELLED CANCER OF THE CERVIX. Nullipara, aged 40. The growth had formed a small ulcer on the posterior lip of the external os. The section is taken through the edge of the ulcer and shows that the growth has penetrated into parts still covered by normal squamous epithelium. A good deal of round-celled infiltration is seen in the superficial parts.

*Adeno-carcinoma* is formed either from the columnar epithelium or from the gland tubules of the cervical endometrium.

The earliest change observed is multiplication of the cells so as to form several layers, instead of a single layer, which is the normal arrangement. Thus in the case of a gland tubule the lumen becomes gradually filled up, and then enlarges so as to form a solid mass of epithelium of considerable size surrounded by stroma, i.e. the arrangement is alveolar. The outermost layer of cells is usually definitely columnar, those filling the spaces are rounded or polygonal, and there are no epithelial pearls. These changes are seen in fig. 133, which represents an early stage of cancer starting in a cervical erosion. On comparing this figure with fig. 92 it will be seen that the surface presents the general arrangement of an erosion, but the covering epithelium is stratified

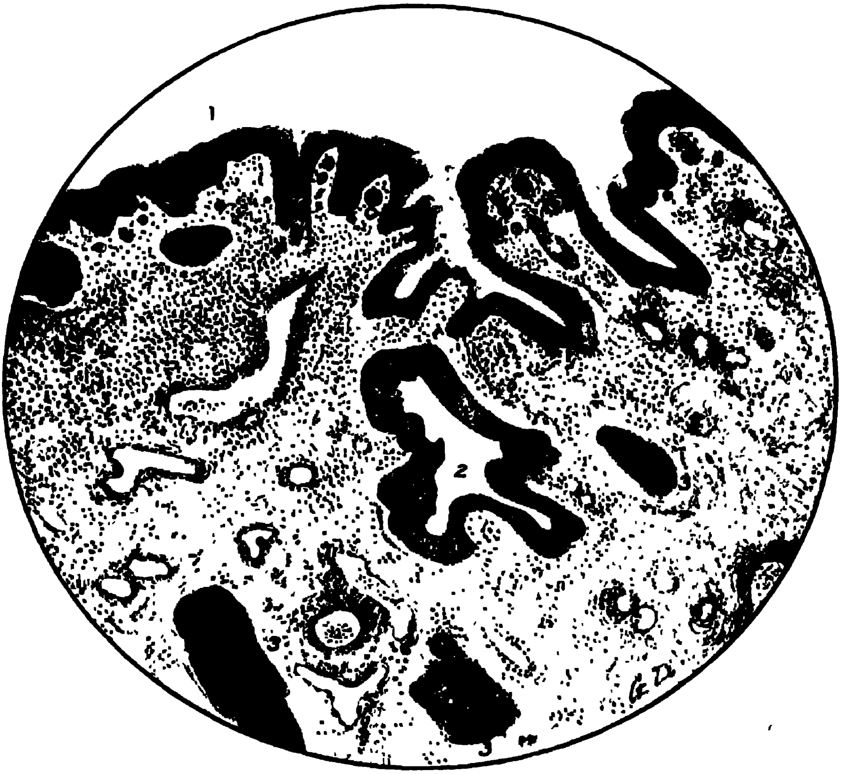

Fig. 133.—Carcinoma of the Cervix. The cancer has arisen in an 'erosion.' The epithelial covering (1) is stratified by proliferation; the deep glands (2) show the same change; alveoli packed with cancer cells are seen at (3).

and forms a thick layer. Immediately beneath the surface is a section of a gland which shows the same epithelial proliferation, although the contour and lumen are still preserved. In section are also seen several solid masses of epithelium which probably represent gland lumina filled up at a more advanced stage of the same process.

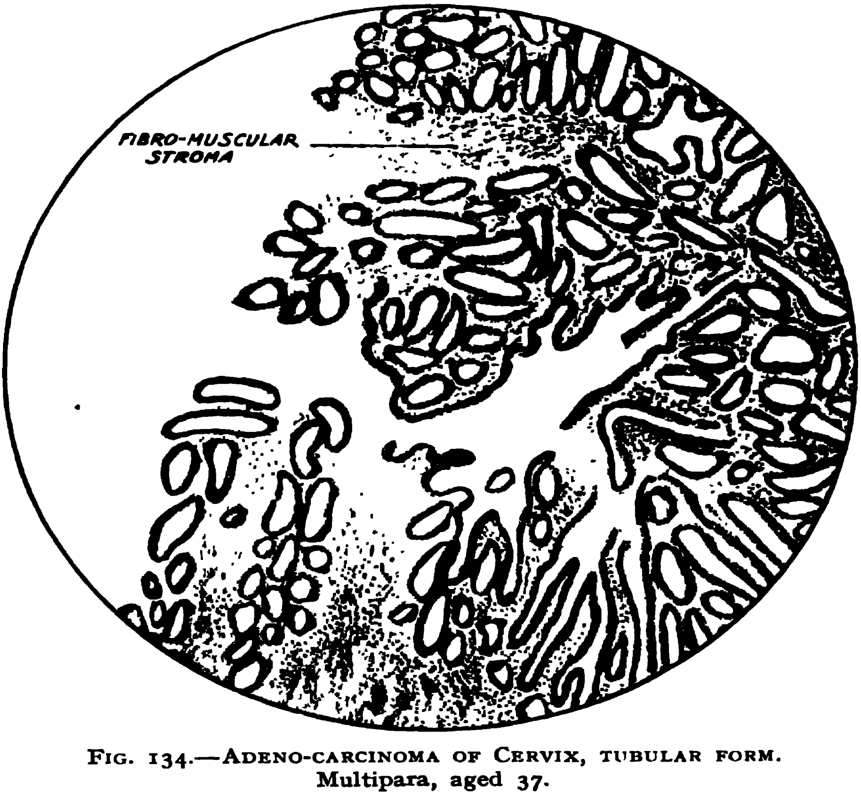

FIG. 134.—ADENO-CARCINOMA OF CERVIX, TUBULAR FORM. Multipara, aged 37.

Later the cancer cells break through the alveoli to invade and destroy the surrounding stroma. It will be seen that, so far, the ~~general~~ arrangement is not unlike that of squamous-celled cancer; and in advanced cases diagnosis can only be made by tracing the formation of the cancer masses, in the one case to the squamous epithelium, in the other to the glands or the columnar endometrium.

In some cases, relatively rare, the gland tubules proliferate freely by budding, preserving their lumen and showing little tendency to stratification of the epithelial lining. The stroma in these cases becomes extensively destroyed, so that the gland tubules lie in contact with one another (fig. 134), the appearances being practically identical with the *tubular* form of adeno-carcinoma more often seen in the uterine body (p. 299). The tubular variety of cancer is much more infrequent in the cervix than either of the other varieties. The histological evidence of malignancy in these cases consists mainly in the invasion and destruction of the stroma by the proliferating tubules.

**Spread of Cancer of the Cervix.**.—The disease spreads by continuity and by lymphatic infection. By *continuity* the cervical form first extends around the os externum to the opposite side, and upwards in the deep cervical tissues towards the os internum, the cervical canal becoming ultimately extensively involved. From the cervix it spreads downwards over the vaginal walls, but only in fairly advanced stages. In both cervical and endocervical cancer the growth spreads outwards to the pelvic cellular tissue, the first parts to be affected being the utero-sacral and broad ligaments. From the cellular tissue extension anteriorly to the bladder occurs with relative frequency, and in endocervical cancer somewhat earlier than in the cervical form. As a result of necrosis or sloughing of the tissues a zone of cellulitic inflammation may be formed which cannot be distinguished clinically from malignant infiltration. The terminal portions of the ureters may become obstructed in advanced cases, either by compression from infiltration of the surrounding cellular tissue, or by direct extension of the growth to their walls. Dilatation of the ureter above the obstructed portion may then occur. The endometrium of the body is seldom invaded by the growth, the internal os appearing to act as a barrier to its advance in that direction. But the uterine cavity may become infected from the ulcerating cancerous tissues, and when the cervical outlet is obstructed by new growth, pyometra, and consequent upon this pyosalpinx, are frequently met with in the later stages of the disease. The peritoneal covering of the cervix posteriorly is not infrequently attacked, leading to spread of the disease to the pouch of Douglas and the rectal wall. The rectum is, however, much less frequently involved than the bladder in cancer of the cervix.

The cervical *lymphatic* stream passes outwards through the bases of the broad ligaments, following the line of the uterine vessels to the iliac glands situated upon the pelvic wall in the bifurcation of the common iliac artery. Occasionally a single gland is found in the base of the broad ligament itself, but it is not constant. Above, the iliac glands communicate with the lumbar chain. It is well known that glandular enlargement in the neighbourhood of malignant growths is not necessarily cancerous, but may be hyperplastic or inflammatory, and Bonney has described a 'precancerous' condition in such cases.

Metastases in distant organs occur only in the most advanced stages of the disease, and are relatively rare. According to the statistics of the Middlesex Hospital (MacCormac), in 109 autopsies for cancer of the cervix, visceral metastases were only found in 20 per cent., the organs most prone to these deposits being the liver and the spleen. The upper part of the urinary tract is frequently affected from direct extension of the disease to the bladder and ureters, and MacCormac reports that kidney lesions—usually hydro- or pyo-nephrosis—were present in 43·5 per cent. of his series of autopsies.

**Clinical Features.**—Cancer of the cervix is a disease which is encountered more frequently in parous than in nulliparous women; after allowance has been made for the fact that there are many more women of the former class than the latter, there is no doubt that child-bearing is a condition which predisposes to the occurrence of this form of cancer. The Middlesex Hospital statistics, already quoted, showed that only 6 per cent. of these cases occurred in sterile women; other observers have placed the percentage of nulliparae at only 3 to 4 per cent. The cervical injuries which invariably accompany parturition and lead to the production of scar tissue, probably account for this predisposition, for in the case of other organs there is also evidence that injury predisposes to cancer. This view also receives incidental support from the fact that not only are parous women especially liable, but the subjects of cancer of the cervix show a degree of fertility which is distinctly higher than the average. Gusserow found the average degree of parity in 580 cases to be 5·1. Poverty and its associated evils of malnutrition and unhealthy surroundings may also exert a predisposing influence, for the disease is relatively more frequent among the poor than among the well-to-do. The age at which the disease first appears is variable, but the quinquennium 46–50 is that in which it is most prone to develop; yet cases are not very infrequent below 30; while above 70 years of age the disease, though rare, is occasionally met with. In the author's personal experience the youngest case met with was 26, the oldest 77.

In the majority of cases the onset of the diseases precedes, or is synchronous with, the menopause; only in about 38 per cent. (MacCormac) does the disease appear after the menopause has been passed.

(1) **Early Stages of the Disease.**—The earliest symptom met with is almost invariably *hæmorrhage*, slight in amount, irregular in occurrence, or—and this is most characteristic of all—excited by coitus. Sometimes the bleeding is excited by straining at stool, by unaccustomed exertion, or by jolting, as during a railway journey. Menstruation is not necessarily increased in amount or disturbed in rhythm, and there may be no other symptoms whatever at this time. Women who have reached the age at which the disease is most likely to occur attach little importance to slight bleeding of this kind, which they attribute traditionally to the approach of the change of life. The absence of other symptoms, such as pain or discharge, is regarded as an indication that nothing can be wrong. Yet the disease may have been in existence for some months before there is even a trace of hæmorrhage, for this symptom does not appear until erosion of superficial vessels has occurred from necrotic changes in the tumour tissues.

The next symptom to appear is a *discharge*; sometimes its appearance precedes the bleeding, but this is not usual. The discharge at this stage is usually thin, yellowish or brownish in colour, nearly constant, slight in amount, and inoffensive. Like bleeding, it is a consequence of necrotic changes in the tumour tissues. Sometimes it is profuse in amount, and this appears to be especially likely in cases where the predominance of formative processes leads to the production of a large mass of new growth.

No other symptoms than these are to be anticipated until the disease has reached a more advanced stage; there is no ill effect upon the general health, and in most cases there is no pain. The hæmorrhage tends, however, in time to appear more frequently and to become more severe in character; this is especially the case when ulcerative processes predominate.

*Pain* ensues upon the extension of the disease to the pelvic cellular tissue; it may be due in part to the inflammatory reaction which surrounds an ulcerating growth, in part to the obstruction to the circulation produced by the new tissues, whether inflammatory or malignant. The pain is of a dull and aching character, is felt chiefly in the back, is not relieved by lying down, and often the patient complains that it is more severe at night than in the day.

From what has been said it is obvious that the onset of cancer of the cervix is insidious, and the initial symptoms to which it gives rise are apparently trivial in character and comparatively late in appearance. The disease can be recognised at this stage only by careful physical examination, supplemented in some instances by the aid of the microscope. The urgent necessity of making such an examination at the first moment that the case comes under observation must in all cases be borne in mind. Regarding the symptoms as unimportant, patients are sometimes unwilling to submit to the necessary examination. But a medical man is not justified in deferring to objections of this kind, and his duty is, first to explain the necessity of an examination, and then to decline absolutely the responsibility of treatment until an examination has been made. To prescribe, for instance, a drug such as ergot, and the use of a vaginal douche, to a middle-aged woman who complains of intermenstrual hæmorrhage, even though inconsiderable in amount, is to lose time upon which the patient's chances of relief solely depend, in the event of these symptoms being due, as is quite possible, to cancer.

On examining the cervix with the finger the conditions found will depend upon the form the disease has assumed. Often extensive changes will be found in a case in which the duration of the symptoms has been brief and their severity inconsiderable. In cervical cancer the new growth, when comparatively early, forms a firm, but not densely hard, nodular, elevated patch or sometimes a shallow ulcer, involving some part of the os externum and extending over the surface of the cervix. Almost invariably the growth is sessile, and when of large size it causes well-marked alterations in the contour of the cervix. The position of the external os can be defined by touch, as it is not entirely involved in the disease at the stage under consideration. If the surface of the growth is lightly scraped with the unprotected finger-nail it breaks down, being *friable* in consistence, and portions of it come away with a certain amount of bleeding, usually fairly free.

The cervix should next be exposed with a speculum and examined in a good light. The part affected by the growth will be found darker in colour than normal, and dull instead of polished in appearance. Its surface is irregular and in parts, where ulceration has occurred, it is worm-eaten in appearance; this is usually found at the parts near the os externum which represent the oldest portions of the growth. The outlying parts may be smooth and still covered with polished, intact, stratified epithelium. The ulcerated parts bleed when lightly swabbed with cotton wool. In cases such as this the diagnosis of a malignant new growth is not for a moment in doubt, the following points being amply sufficient to decide that the disease is malignant: (1) The area of firm nodular induration; (2) The ulceration of portions of the new growth; (3) The friability of the tissues as indicated by lightly scraping with the finger-nail; (4) The free bleeding thus excited.

Lastly, a rectal examination should be made in every case of cancer of the cervix; thickening of the utero-sacral folds and of the bases of the broad ligaments can be more clearly perceived and its extent estimated than by the vagina. The posterior surface of the supra-vaginal portion of the cervix is also accessible from the rectum, and accordingly a more complete impression of the extent of the disease in position can be obtained.

Occasionally, when the disease comes under observation before ulceration has occurred, diagnosis may present considerable difficulty. A small, slightly roughened and slightly elevated, dull red patch involving a portion of the external os may then be seen. Spiegelberg has pointed out that while the mucous membrane is slightly movable over the surface of the cervix in health, it becomes adherent at a very early stage to a subjacent malignant growth, imparting to the cervical tissues a firm slippery consistence like that of wet rubber. This sign is, however, seldom of service, as cancer in this position nearly always starts in the mucous membrane itself (see p. 275). Non-ulcerated patches of cancer bear a certain resemblance to a *cervical* '*erosion,*' but this resemblance is not close enough to mislead any but an inexperienced observer. To the touch the 'erosion' feels smooth and soft like velvet, while the cancer is slightly roughened or distinctly nodular; the tissues of the 'erosion' are firm and non-friable to the finger-nail; although an 'erosion' sometimes bleeds from one or two points after swabbing with cotton wool, the amount is small and the oozing is not general as in the patch of cancer. Actually, 'erosions' show little tendency to become malignant, but in all cases in which the least doubt exists a section should be taken for microscopic examination. This must be done with care, a piece about a third to a half inch in diameter being cut out of the edge so as to include a definite area of outlying healthy tissue, and the excised piece dropped immediately into a weak solution of formalin before being sent to the histologist.

The early malignant ulcer may be confused with *tuberculous disease* or with a *chancre.* Tuberculous disease of the cervix is rarely primary, and accordingly the presence of signs of tubercle in other organs may direct attention to the possibility of the cervical lesion being of the same nature. The local appearances are not dissimilar to those of cancer, and numerous cases have occurred in which the uterus has been removed on account of cervical disease which has been subsequently proved to be tuberculous, not malignant. Tuberculous disease of the cervix gives rise to free muco-purulent discharge, but not usually to spontaneous bleeding, and its tissues are not friable like those of the malignant ulcer. However, microscopic examination must, as a rule, be resorted to before the tuberculous nature of the ulcer can be definitely settled. *Cervical chancre* is also a rare occurrence, and its nature is soon revealed by the appearance of the early constitutional signs of syphilitic infection.

*Endocervical Cancer.*—Cancer in its endocervical form is less easily recognised by physical examination than when the vaginal portion is attacked. Beginning within the cervical canal the growth shows little tendency to spread in the direction of the external os, at any rate until an advanced stage is reached (fig. 129). The disease first infiltrates the fibro-muscular tissues, leading to broadening and induration of the cervix, while the os externum and the vaginal surface remain unaffected. The only appreciable alteration then felt is enlargement, densely hard in consistence, of the supra-vaginal cervix, which will be felt upon upward pressure through the vaginal fornices. Sometimes this increase in density and in bulk will be detected only by rectal examination, as rectal examination alone can reveal the true extent of the disease when the upper part of the cervix is chiefly attacked. When the disease is fairly advanced it reaches the os externum, which then becomes enlarged by ulceration, exposing the lower part of the growth, which then presents as a nodular friable mass. At a still later stage an extensive crateriform cavity continuous with the vagina may be formed by ulceration.

(2) **Advanced Stages of the Disease.**—The advanced stages of cervical cancer are characterised by free putrid discharges with hæmorrhage, at times constant, at times irregular and profuse, at times quite uncontrollable. In the ulcerating form the cervix has disappeared, and in its place is found a large crateriform or cup-shaped cavity, with indurated ragged walls, extending upwards to the lower part of the body cavity, and also involving the vaginal fornices to a greater or less extent (fig. 128). The disease may indeed advance upon the vaginal walls, especially the anterior wall, nearly as far as the ostium vaginae. In all such cases the pelvic cellular tissue has been invaded, and this will be perceived much more clearly by rectal than by vaginal examination. By vaginal examination the limits of the growth cannot be defined, but only the limits of the cavity formed by ulceration. By rectal examination the mass of new growth will often be found surprisingly large, extending forwards and on each side to the bony pelvic walls, and backwards so as to encroach upon the lumen of the bowel. The mass feels densely hard and often tender, and is almost, if not entirely, immovable.

In the advanced stages of the formative type a large mass of new growth is formed occupying the upper part of the vaginal canal. This mass is attached to, or has replaced, the cervix; sometimes its surface is divided up by sulci into a complex papillary arrangement resembling a cauliflower; sometimes the surface is uniform and rounded. In both cases the growth is dark coloured, and shows superficial sloughing. Sometimes the mass of cancer is so large as to fill the whole of the vagina, and present at the ostium vaginae, coming into view when the labia are held apart by the fingers. The position of the external os can seldom be defined in stages so advanced as this. In this form also the extent to which the disease has spread deeply can best be defined by rectal examination. Such cases must be carefully distinguished from large sloughing fibroid polypi, and this can invariably be done by recognising, in the case of the polypus, the stalk which attaches it to the uterus. An anæsthetic will be necessary if the growth is very large, in order to allow of the finger being passed up far enough to reach the pedicle. In both cases the hæmorrhage is often very free during examination.

In the advanced stages of cancer of the cervix the *general symptoms* become prominent. Loss of flesh occurs comparatively late, and in elderly women, at any rate, it progresses very slowly. Anæmia is always present as an element in the cancerous cachexia, but sometimes, as the result of profuse losses of blood, profound anæmia occurs at an earlier period than this. In other cases cachexia ensues somewhat rapidly, being in all probability accelerated by absorption of toxic products from large ulcerating or necrotic growths. Loss of appetite and want of sleep due to nocturnal pain further aggravate the general ill-health.

As the local disease comes to involve *other pelvic organs* a fresh train of symptoms appears. The tendency of the disease to spread to the bladder has been already referred to, but a considerable area of the muscular wall of the bladder may be involved without giving rise to hæmaturia if the mucosa escapes; consequently it is not until ulceration occurs and a vesico-vaginal fistula is about to be formed that the extension is revealed. The cystitis and urinary incontinence which result from this fistula add greatly to the patient's distress. Occasionally infection of the kidneys from cystitis, or from ulceration of the pelvic portion of the ureters, occurs, and leads speedily to a fatal termination.

A different train of symptoms may arise from infection of the uterine cavity, which, aided by obstruction to the escape of discharges into the vagina, leads to the formation of a *pyometra.* By direct extension from an infected endometrium a pyosalpinx may be formed on one or both sides, and from this again septic peritonitis may arise, which of necessity proves rapidly fatal. Pyrexia and abdominal distension in the late stages of cancer of the cervix usually indicate this complication.

**Diagnosis of Operability.**—Under this heading we consider the circumstances under which a radical operation is practicable. The lymphatic glands which drain the cervix are so situated as to be inaccessible to clinical examination, and in consequence the question of operability has to be considered without reference to their condition. There are two points only, in regard to the local conditions, upon which reliance can be placed, viz. the degree of mobility of the uterus, and the changes which have occurred in the uterine ligaments. *Mobility* may be tested with the fingers during bimanual examination, the extent to which the cervix can be moved in all directions being carefully observed. Sometimes it may be possible to seize a healthy portion of the cervix with a vulsellum forceps and gently pull it down towards the vulva; in the case of a parous woman the normal mobility allows of the os externum being thus drawn down to the vulva. Fairly free mobility at once decides in the affirmative the question of operability. When mobility is considerably limited the condition of the *ligaments* must be carefully explored, and it must be insisted upon that the rectum is the proper channel for exploring these ligaments. Thickening and induration of the utero-sacral ligaments is very readily felt from the rectum, as the finger passes upwards in the middle line between them. By exploring laterally with the finger-tip at about the same level, the bases and posterior aspects of the broad ligaments will also be felt. Moderate thickening of these ligaments does not necessarily imply malignant invasion; old-standing inflammatory changes also give rise to thickening in the same position. In the latter case, however, it is sometimes possible by careful examination to distinguish the outlines of thickened tubes and ovaries in the affected parts (see p. 426). When extensive malignant invasion of these ligaments has occurred, the individuality of their component parts becomes merged in an ill-defined swelling lying in each posterior quarter of the pelvis, and usually more extensive on one side than the other.

Cases are certainly *inoperable* when profound anæmia from bleeding, or signs of cachexia are present, when the cervix is fixed, and the ligaments thickened and fused with one another, or when fistulous communications have been formed with other organs.

Cases are certainly *operable* in which the cervix has retained its mobility, the ligaments are little, if at all, thickened, and the general condition of the patient is unaffected, or at any rate little impaired.

Between these limits lie a large number of cases which are doubtful. In considering these cases too much importance should not be attached to the extent of the disease in the cervix, if the cellular tissue is free and a fair degree of mobility is preserved. The presence of an offensive discharge is in itself no contra-indication to radical operation. The complete hopelessness of palliative treatment justifies an attempt being made to eradicate the disease, unless the indications that it is inoperable are quite clear.

**Duration and Prognosis.**—According to MacCormac's series, the average duration of the disease in ninety-two cases not operated upon was 1·6 year from the onset of the symptoms; it has been already pointed out that the actual onset of the disease antedates the onset of symptoms by a variable but considerable interval. Cases in which the disease occurs comparatively late in life, after the menopause, run a less rapid course than those which occur at an earlier age, and women of sixty to seventy years of age sometimes survive for five or six years when no surgical treatment has been adopted. Below thirty-five years of age the expectation of life is very short, for the disease often terminates within a year. The rate of advance does not appear to be affected by the histological variety of the growth.

The causes of death are frequently to be found in the complications which accompany the later stages of the disease. Those most frequently met with are the spread of septic infection to the peritoneum and to the kidneys.

## CANCER OF THE BODY OF THE UTERUS

**Pathological Anatomy.**—Cancer of the uterine body arises in the endometrium, from the epithelium of the surface or from that of the glands. It may attack an otherwise healthy uterus or one which is already the seat of a fibroid tumour. The upper part of the uterine cavity is first

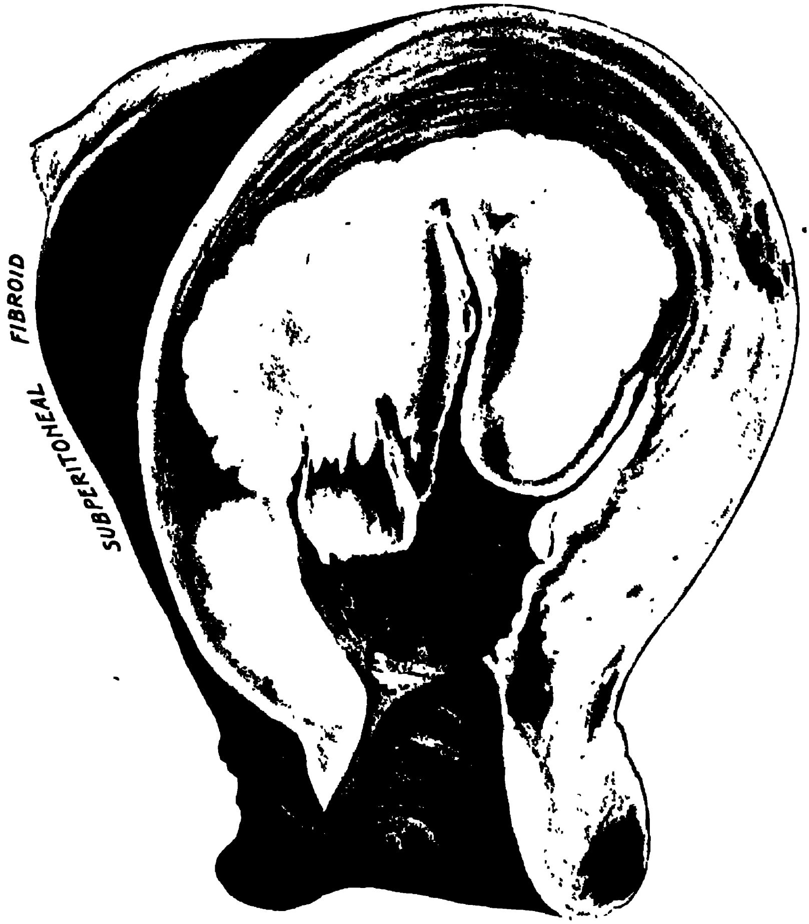

FIG. 135.—CARCINOMA OF THE BODY OF THE UTERUS: a small subperitoneal fibroid was also present. Multipara, aged 49. The growth consists of tuberous masses arising at the fundus and projecting into the uterine cavity. The growth has extended over the endometrium to the internal os. Invasion of the fibro-muscular tissue is clearly seen.

affected (fig. 135) in the great majority of cases, and sometimes in the early stages two or more isolated areas of cancer may be found separated by healthy endometrium (fig. 120). As the disease advances it tends to overrun the whole of the mucous membrane, and may then appear to naked-eye examination in one of two different forms. In the commoner *tuberous* form large, projecting, sessile masses of new growth are formed which more or less completely fill up the enlarged uterine cavity (fig. 135). In the rarer *papillary* form the new growth consists of large numbers of delicate

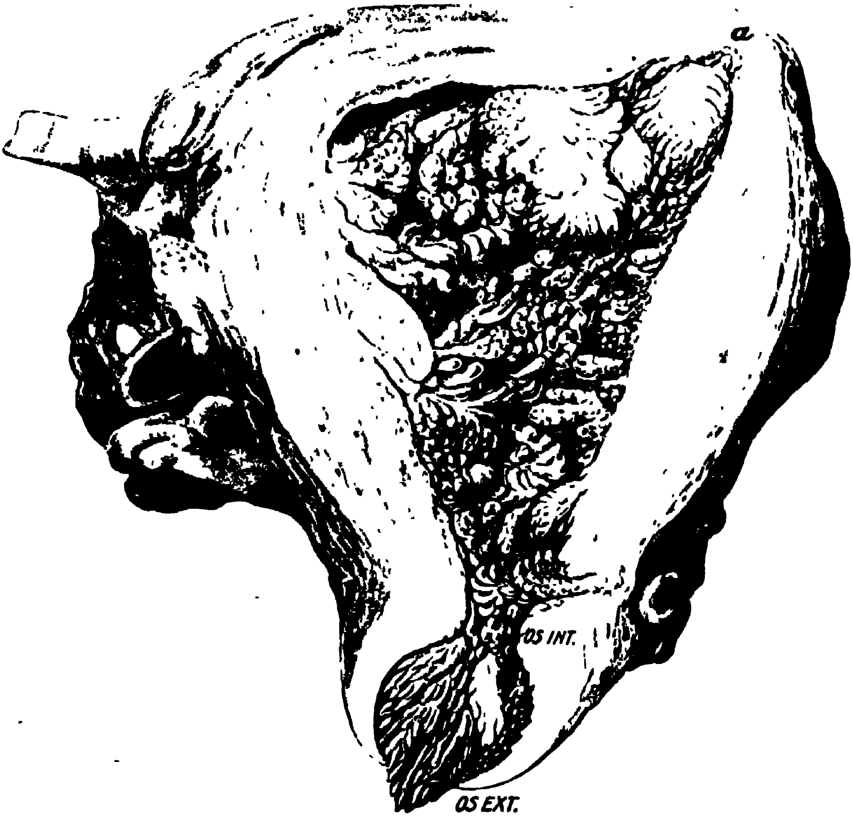

FIG. 136.—CARCINOMA OF THE BODY OF THE UTERUS. Nullipara, aged 56. The uterine cavity is occupied by a mass of papillary or villous growths which protrude from the external os. At *a* and at a point just above the internal os the growth has invaded the muscular wall.

polypoid processes, sometimes branching, sometimes divided by sulci on their surface (fig. 136). In some cases this rapid diffusion of the disease over the whole uterine surface is not seen, but instead a mass of growth is found upon a single spot, and the form then assumed by the disease is *polypoid*.

The disease rarely passes through the internal os to attack the cervical endometrium, and invasion of the fibro-muscular wall of the uterus occurs later than in cancer of the cervix, but can always be seen by the naked eye in advanced cases. Formative processes are commonly in the ascendant, and ulceration of the growth, so common in cancer of the cervix, is much rarer; the greater freedom of the uterine cavity from infection from without perhaps explains this difference. Enlargement of the body of the uterus, as a rule, is only of moderate extent; it is

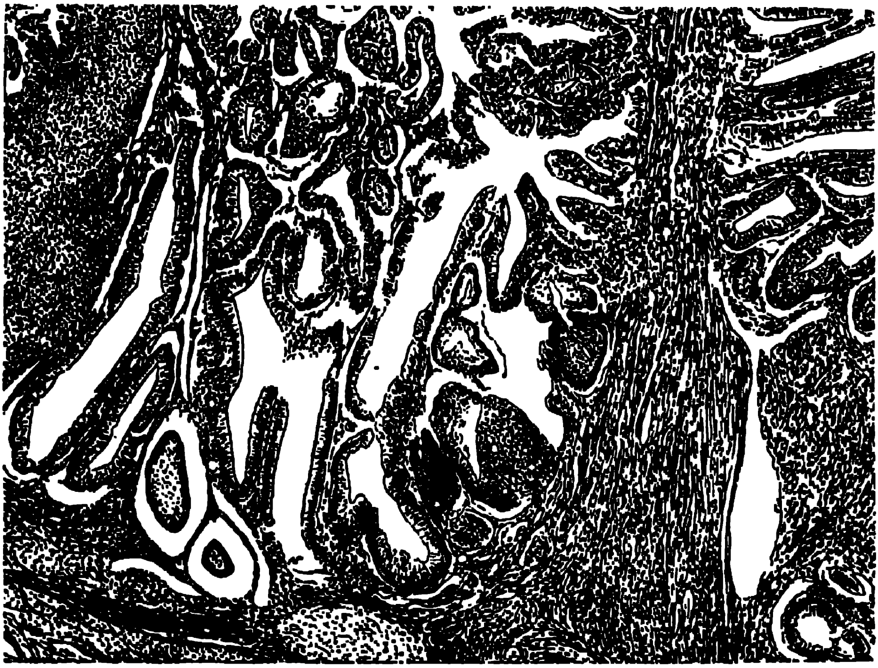

FIG. 137.—ADENO-CARCINOMA OF THE BODY OF THE UTERUS: TUBULAR FORM. The central space occupied by the new growth which consists of irregular epithelial tubules, is limited by well-preserved fibro-muscular tissue, showing that invasion of the uterine wall has occurred.

rare for these tumours to attain a large size, but Spencer has recorded an exceptional instance in which the uterus weighed 1 lb. 1½ oz., and measured 5¼ inches in length. The normal contour of the uterus is, as a rule, preserved, for the growth invades the uterine wall very slowly, and seldom reaches the peritoneal coat except in advanced stages (fig. 144). From the upper angle of the uterine cavity the growth frequently extends to the interstitial portion of the tube (fig. 136).

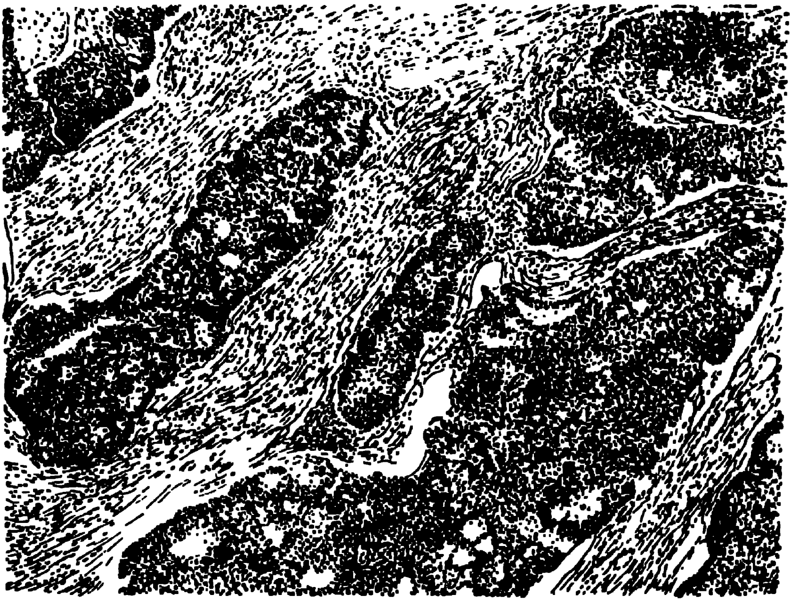

FIG. 138.—ADENO-CARCINOMA OF THE BODY OF THE UTERUS: ALVEOLAR FORM. The cancer cells are arranged in closely packed spaces limited by well-preserved fibro-muscular tissue.

*Microscopically* cancer of the uterine body is almost invariably adeno-carcinoma, but a few rare instances of primary squamous-celled cancer have been described.

*Adeno-carcinoma* may assume two different forms—*alveolar* and *tubular*, closely resembling those which occur in the cervix. The *tubular* form is here the more common (fig. 137); it consists of an irregular and very free proliferation of gland tubules of varied shape and size, which lie in contact with one another, the stroma being scanty. The tubules are lined with high columnar epithelium which differs from that of the normal uterine glands, inasmuch as the nuclei are placed at irregular levels. At the growing edge the tubules may be seen to invade and destroy the tissues of the uterine wall. The epithelium of individual tubules does not proliferate so as to fill up the lumen. In some parts of an adeno-carcinoma the growth often consists of masses of delicate, compound, branching papillae, consisting of a slender and very vascular connective tissue core, covered with two or three layers of columnar epithelium. The surface cells of the papillae proliferate freely and irregularly, and islets of cells, detached from the papillae, are frequently seen in the microscopic field.

In some cases tubular cancer of the uterine body presents somewhat different features; the growth consists of an aggregation of tubules, of perfectly regular and uniform characters, lined with a single layer of regular epithelium. The stroma is scanty, the tubules invade and destroy the fibro-muscular wall, and if the growth is removed by scraping it recurs. The name of *adenoma malignum* is sometimes applied to this form, but its characters are not sufficiently distinctive to call for a special designation, and it is better to include it among the adeno-carcinomata.

The *alveolar* form closely resembles that found in the cervix, as will be seen by comparing figs. 133 and 138.

*Squamous-celled Cancer.*—In a small proportion of cases of chronic endometritis it has been observed that the normal columnar epithelium on the surface has been replaced in isolated patches by stratified squamous epithelium, and cell metaplasia, resulting from prolonged irritation, has been assumed to be the cause. A very few cases of primary squamous-celled cancer have also been described in the body of the uterus; in some of these the whole of the growth was of this nature, in others, parts were squamous-celled, and parts adeno-carcinomatous. It can only be recognised by microscopic examination, when the general appearances described in connection with the same growth in the cervix will be met with.

**Spread of Cancer of the Uterine Body.**—Cancer remains limited to the affected organ much longer when occurring in the body than in the cervix. It tends less rapidly to infiltrate the uterine wall, and lymphatic infection also proceeds more slowly. Glandular enlargements are therefore less often met with in operable cases of cancer of the body than of cancer of the cervix. The lymphatics which drain the uterine body run along the upper border of the broad ligament in close relation with the ovary and Fallopian tube (fig. 43), and then accompany the ovarian vessels over the brim of the pelvis to reach the lateral chains of lumbar glands lying at each side of the spinal column. A lymphatic vessel also runs from the fundus to the inguinal chain of glands in company with the round ligament. None of these glands, however, become enlarged except in very advanced stages of the disease. Secondary growths sometimes occur in the vagina from direct implantation of cancer cells carried down from the uterus in the discharge. Ultimately the peritoneum and pelvic cellular tissue become infiltrated in the same manner as in cancer of the cervix, but not until the disease has advanced much further. The results are, however, much the same, and in fatal cases metastases have been discovered in the liver, omentum, adrenals, etc.

Pyometra is a common complication of the advanced stages, and hæmatometra may also be met with, although more rarely.

**Clinical Features.**—Cancer is of much rarer occurrence in the body than in the neck of the uterus, the proportion being about 1 to 15. Multiparous women do not display the same tendency to suffer from cancer of the uterine body as from cancer of the cervix. Statistics show that about one half of the recorded cases of cancer of the body occur in nulliparous women, and the parous women affected show but a low degree of fertility, averaging one child each. It occurs with greatest frequency at a later age than cancer of the cervix, viz. between fifty and sixty; women are therefore more likely to be attacked by this disease after the climacteric has been passed than when it is anticipated. Below the age of forty it is very uncommon.

As in the case of cancer of the cervix, the earliest symptom to appear is hæmorrhage, slight and irregular in its occurrence. After the menopause this symptom attracts the attention of the patient more readily than at an earlier age, although even then many women are content to ascribe it to a slight return of the monthly periods. Unfortunately this symptom is even later in occurring than is the bleeding of cancer of the cervix. It follows that early recognition of this disease is quite as difficult as that of cervical cancer.

The remarks previously made as to the necessity of an early examination in cervical cancer apply equally to the case under consideration. When in cases of irregular bleeding in middle-aged or in elderly women the cervix is found to be healthy, the possibility of cancer of the body being present must be considered next. On bimanual examination nothing will be detected, in all probability, except a moderate and symmetrical enlargement of the body of the uterus—unless fibroids are also present, when the shape of the uterus may be distorted. No limitation of mobility is to be expected at this stage of the disease. If the sound is passed, enlargement of the uterine cavity may be detected, both in length and in capacity; free bleeding may occur, fragments of whitish friable material may come away, or in cases less advanced, by rotating the handle of the sound the presence of a rough, bleeding area near the fundus may be detected. The sound must be used with great care when cancer of the body is suspected; in advanced cases with offensive discharges and free bleeding it is better not to use it at all owing to the risk of perforation and, as a consequence, septic peritonitis.

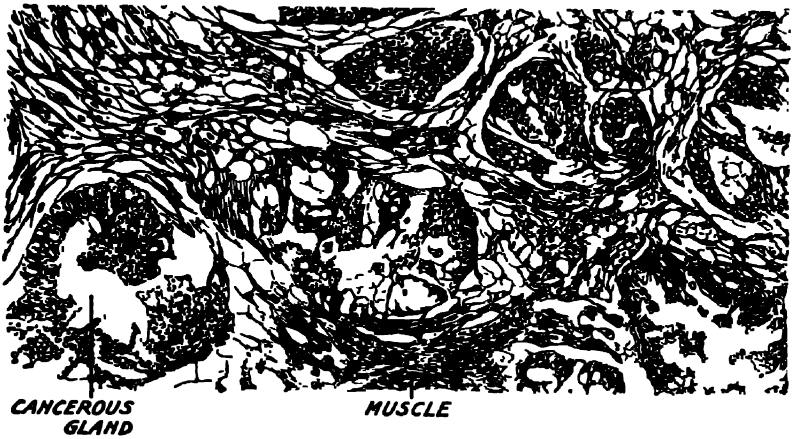

FIG. 139.—SCRAPING FROM A CASE OF CARCINOMA OF THE UTERINE BODY. Patient aged 49, multipara. The glands show epithelial proliferation of irregular type, and fragments of muscular tissue were found. From the same case as fig. 135.

It is clear that in the early stages a definite diagnosis of cancer of the uterine body can be made only by a diagnostic curetting for microscopic examination, or by exploration of the uterine cavity with the finger (see p. 573). Usually the former is preferable, for in nulliparous women who have passed the menopause it is difficult to dilate the cervix sufficiently to introduce the finger without causing considerable laceration. The conditions which have to be distinguished from cancer of the body are senile endometritis, and an interstitial fibroid which is causing hæmorrhage owing to some degenerative change.

The appearances which may be expected in curettings for uterine cancer are shown in fig. 139. The fragment of tissue here shown consists of a fibro-muscular stroma altered by œdema and degeneration, but in which clusters of muscle fibres are preserved. Several irregular areas of epithelial cells are seen, some of which have preserved the general contour of a gland, but show well-marked proliferation of the epithelial lining. The atypical epithelial proliferation and the inclusion of fibro-muscular tissue in the scrapings sufficed in this instance to determine the diagnosis of cancer.

In the advanced stages offensive discharges due to ulceration of the growth are met with ; fixation occurs and is often due to direct transperitoneal extension of the growth to the wall of the rectum, pelvic colon or cæcum ; the cellular tissue also becomes infiltrated, but this occurs at a much later period than in cancer of the cervix. In other respects the final stages of the disease are similar to those already described in cancer of the cervix.

## TREATMENT OF UTERINE CANCER

When the uterus is attacked by cancer in any part, extirpation of the diseased organ with its appendages offers the sole chance of recovery. The insidious nature of its onset, the popular misconception of the importance of the early symptoms, and the reluctance of patients to submit to, and of doctors to insist upon, an immediate internal examination, together account for the fact that a large proportion of cases first come under observation when the disease has already reached a stage at which a radical operation is impracticable. A radical operation should be advised and attempted whenever there appears to be a reasonable hope of its performance being possible. The prognosis as regards recurrence after hysterectomy is unusually good in the case of cancer of the body, for the anatomical reasons which have been already mentioned. In cancer of the cervix the prognosis is much less favourable, owing to the tendency to early involvement of the cellular tissue and lymphatics, and possibly to the greater activity of the cancer elements. The modern operation introduced by Wertheim (p. 553) may, when it has been fully tested by experience, be found to have considerably improved the prognosis as regards recurrence, but at present this cannot be definitely stated to be the case. Writers upon cancer statistics usually regard as 'cured' all cases in which five years have elapsed after the operation without recurrence, and on this basis the percentages of 'cures' have been variously estimated at from 5 per cent. to 25 per cent. of those who survive the operation. The prognosis as regards recurrence is very much more favourable in corporeal than in cervical cancer.

Even when radical operation is followed after an interval by recurrence, the advantages derived by the patient are considerable. Not only is there a definite prolongation of life, but the disease when it recurs assumes a much less distressing form. The growth is almost entirely internal and is not so liable to ulcerate; the distressing discharges caused by the primary growth are absent, and the final stages of the disease are less liable to be aggravated by the establishment of fistulous communications with the bladder or the rectum.

Methods of hysterectomy suitable for these cases will be described in a later section (p. 552).

*Palliative operation* may be practised when the disease is too far advanced for total extirpation. It consists in the removal of as much as possible of the growth with the sharp spoon and the cautery. This procedure is distinctly serviceable when there is a large mass of new growth giving rise to free offensive discharges and to hæmorrhage, for these symptoms are, for a time, relieved with benefit to the patient's health and relief to her distress. When the growth recurs rapidly curetting can be repeated. In cases of the ulcerative type scraping is undesirable, for the bladder may be perforated by the spoon, or a large vessel laid open occasioning hæmorrhage difficult to control. In cases where the hæmorrhage and discharge are not great, the mass of new growth small, and its rate of advance slow, it is better to do nothing if a radical operation is impracticable. These conditions are most likely to be met with in women of between sixty and seventy years of age, and in such cases life may be prolonged for a year or more after the disease has reached an inoperable stage.

*Medical treatment* resolves itself into the relief of pain, the alleviation of putrefactive changes by antiseptic douches and vaginal tampons, the arrest of attacks of hæmorrhage, and care of the general health. None of the so-called 'cancer cures' are of any real service. Electricity in the form of the high tension current has a certain value in relieving pain; radium and X-rays appear, at present, to be of little value in the treatment of this, as of all other internal forms of cancer. The use of local applications of powerful caustic substances, such as chloride of zinc, to the accessible portions of the growth, has been abandoned. Recently, however, the use of *acetone* as a local escharotic has been favourably reported upon by Gellhorn and others; this fluid substance hardens the tissues it destroys, and in so doing brings about the cessation of bleeding and discharge until the necrosed layers have been cast off, when the application may be renewed. No extensive trial of this procedure has yet been reported.

For the relief of *pain* opium in some form becomes ultimately necessary, and that in increasing doses; in the earlier stages aspirin, pyramidon, or some other synthetic analgesic substance, may prove sufficient. Resort to the use of opium should be delayed as long as possible, in consequence of the rapidity with which tolerance of this drug may become established and the consequent necessity of continually increasing the dose. Codein is in some respects preferable to morphia, and heroin also forms a useful alternative to morphia, as it does not give rise to the after effects, such as nausea and constipation, which are so often conspicuous when morphia is employed.

Of antiseptic douches the most generally useful as deodorants are formalin and peroxide of hydrogen. The former must be used in weak solution of about 1/1000 of the 40 per cent. solution. Peroxide is non-irritating and may be used in the same strength as for general surgical purposes, e.g. 1/5 to 1/10 of the twenty-volumes solution. Strips of iodoform or bicyanide gauze may be packed round the cervix and changed twice or three times in twenty-four hours.

Drugs are of little use in the control of hæmorrhage. Turpentine in five-minim doses, given in capsules, sometimes appears to do good. Severe bleeding must be treated by plugging the vagina.

## SARCOMA OF THE UTERUS

Sarcoma may arise in the uterus from the plain muscle fibre, from the connective tissue, or, according to Wilms, from certain cells of intermediate embryonic type which exist in this organ. Its starting-point may be the stroma of the endometrium, the fibro-muscular uterine wall, or a pre-existing fibroid tumour. For descriptive purposes these growths are classed as *Sarcoma of the Uterine Wall*, and *Sarcoma of the Endometrium*.

**Sarcoma of the uterine wall** occurs usually as a solitary, globular mass of softish friable consistence, which in its early stages is encapsuled (fig. 140). In colour it is dull yellowish, in consistence it is homogeneous and shows none of the fibrillated appearances characteristic of fibroids (fig. 140). Its surface is often discoloured in patches from necrosis and interstitial hæmorrhage. Sarcomatous areas in a fibroid tumour show appearances similar to these.

Sarcoma of the uterine wall is of comparatively slow growth, and tends to grow out of the wall in either direction, projecting more often upon the mucous than the serous surface. The uterine enlargement is often irregular in shape. It is usually of only moderate size, seldom exceeding the bulk of the fœtal head; when fibroids are present the whole tumour may, of course, be very large.

**Sarcoma of the Endometrium** is much rarer than the form just described. In some instances it becomes rapidly *diffused*, involving the whole of the mucosa. Its general appearance corresponds with that of intra-mural sarcoma, but the tissues are softer and more friable, so that loose pieces are often found in the uterus or may be discharged through the cervix. More often it is not diffused, but grows irregularly, forming *polypoid* masses which are not infrequently multiple but seldom exceed the size of an orange. The diffused form is more common in the body, the polypoid form in the cervix. The enlargement of the uterus is symmetrical and of only moderate extent.

**Vesicular Sarcoma** (*Sarcoma botryoides*). — This is a polypoid sarcoma of the endometrium, characterised by the formation of a collection of globular, grape-like vesicles, connected in irregular series, or attached to the uterine wall by delicate stalks. Its seat of election is the cervix (fig. 141), but sometimes sarcomata of the body show similar appearances in parts. The vesicles are at first semi-translucent, being thin-walled and containing a clear yellow fluid; later on they become discoloured from hæmorrhage. Large masses of new growth of this kind may be formed on the cervix which project into and distend the vagina.

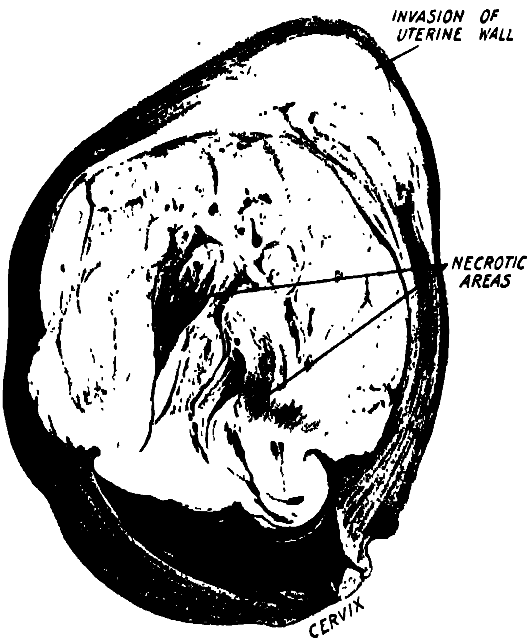

FIG. 140.—SARCOMA OF THE UTERINE WALL. Multipara, aged 60. At the fundus the growth has invaded the uterine wall; the lower part projects into the uterine cavity.

**Microscopic Characters of Sarcoma of the Uterus.**—The general features are those of a mixed-celled sarcoma; the greater part consists of masses of round or spindle cells, the latter displaying the oat-shaped nuclei characteristic of sarcoma in all parts (fig. 142). In most instances giant cells are also present. The stroma is very scanty, the blood-vessels are numerous and very large, their structure being embryonic. The penetration of columns of sarcoma cells between the parallel muscle bundles of the uterine wall can often be traced at the growing edge as in fig. 142. The irregularity in size and shape of the tumour cells forms a striking distinction from the healthy tissues. The cysts of

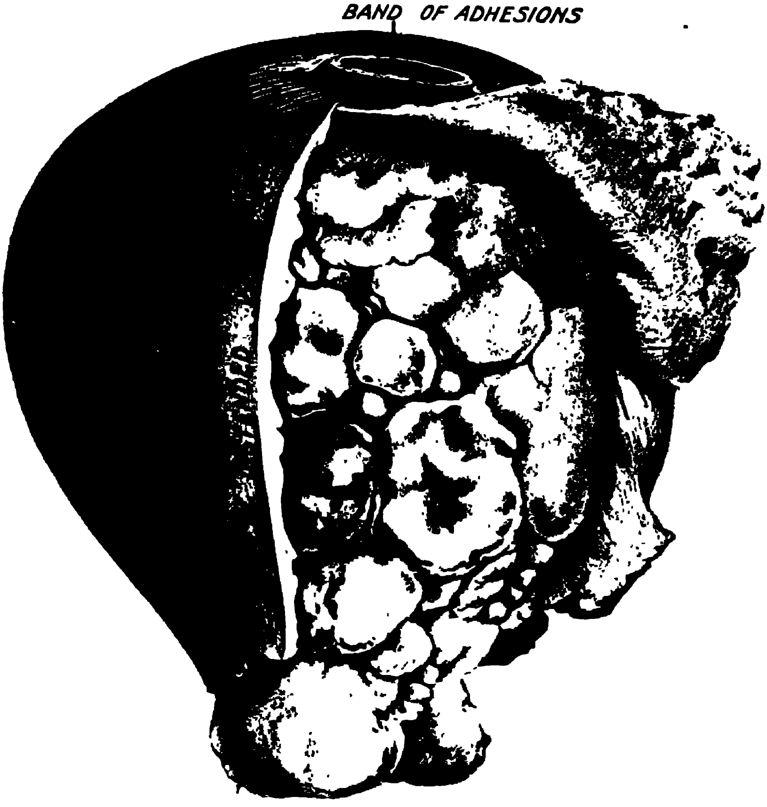

FIG. 141.—VESICULAR OR GRAPE-LIKE SARCOMA OF THE CERVIX (Curtis). Infant, 12 months old. The uterus and vagina were removed by an abdominal operation. The vagina is distended with masses of growth, which are shown by reflecting a portion of the vaginal wall. The uterus is not seen.

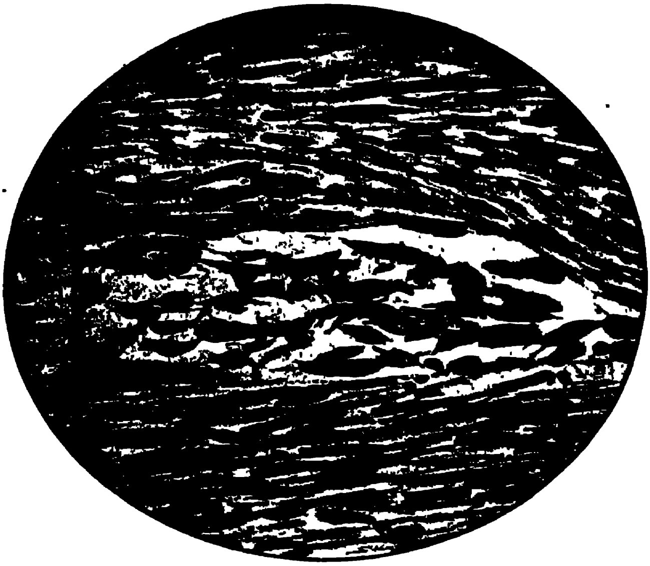

FIG. 142.—SARCOMA OF THE UTERUS; from the same specimen as fig. 140. The section shows in the centre a collection of sarcoma cells, some round, others spindle-shaped, which have penetrated the parallel bundles of muscle fibre seen above and below.

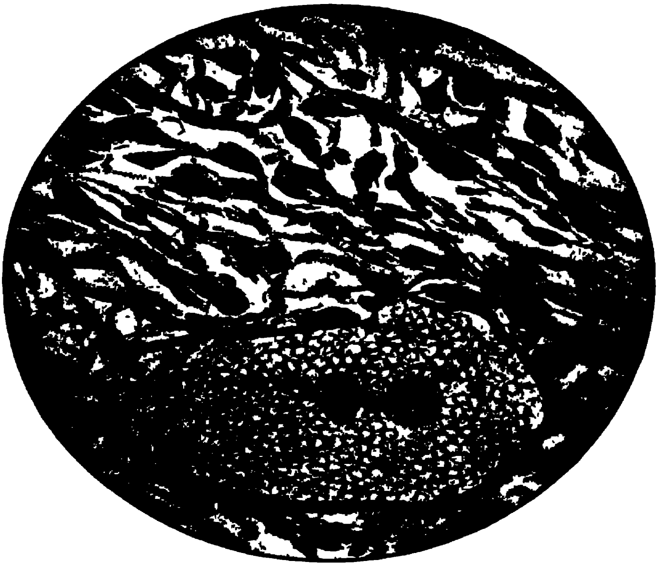

FIG. 143.—SARCOMA OF THE UTERUS; from the same specimen as fig. 142. The growth consists of round, spindle, and giant cells; the large vein shows a giant cell and a cluster of sarcoma cells in its lumen, illustrating the mode of dissemination characteristic of sarcoma.

the vesicular variety are originally covered with a layer of columnar epithelium which is, however, readily detached, and consequently is absent from the larger vesicles. The body of the cyst consists of tissues markedly œdematous, in which round and spindle cells abound.

Sarcoma starting in a fibroid or in the muscle or connective tissue cells of the uterine wall often contains well formed muscle fibres and is distinguished as a *myo-sarcoma*. Mixed forms are occasionally met with in which fatty tissue, cartilage, bone, nerve, etc., are present, and to these varieties the compound names of *lipo-sarcoma, chondro-sarcoma, osteo-sarcoma*, etc., are applied. Although of great pathological interest, these mixed forms of sarcoma are too rare to call for further description; sarcomata of other organs show a similar tendency to the formation of tissues of a higher grade of development.

Hæmatometra is a comparatively common occurrence from obstruction of the cervical canal, and pyometra may also occur, though with less frequency than in uterine carcinoma. Sometimes polypoid sarcomatous growths attached to the fundus cause partial inversion of the uterus.

**Spread of Uterine Sarcoma.**—The intra-mural form is of relatively low malignancy, probably because it remains encapsuled until it has attained considerable size. The channel of dissemination is the blood stream; the large size and the delicate walls of the new vessels favour the entrance of sarcoma cells, and their presence can often be demonstrated in the lumen as in fig. 143. After passing through the uterine wall the growth invades the bladder, the Fallopian tubes and ovaries, and the pelvic lymphatics. In fatal cases submitted to autopsy visceral metastases are found in over 70 per cent. (Veit), the organs most frequently affected being the lungs and the liver; metastases also occur, though much less frequently, in the intestine, the spleen, and the kidneys. Urinary and fæcal fistulae are seldom caused by sarcoma.

**Clinical Features.**—Sarcoma is one of the rarest of uterine tumours; it is much more uncommon than carcinoma, the relative frequency being about one to forty or fifty. Cases occur in infancy and childhood, and an instance in a fœtus has been recorded by Phillips; but the great majority of cases occur in women who have passed the menopause.

From a study of 438 cases Veit concludes that from forty-five to sixty years of age represents the time at which women are most prone to uterine sarcoma. One-fourth of the patients are nulliparous and three-fourths parous.

Sarcoma attacks the body of the uterus more often than the cervix, differing sharply in this respect from cancer. It also forms a much larger tumour than cancer, and so occasions much greater enlargement of the uterus. Usually the enlargement is fairly symmetrical, but may be irregular if the growth projects beneath the peritoneal coat, or if fibroids are present. Vesicular sarcoma, when it occurs in the cervix, is easy of recognition by direct examination.

The *symptoms* to which sarcoma gives rise are hæmorrhage, discharge and pain ; it will therefore be apparent that the symptoms do not allow of its being distinguished from cancer. The bleeding is irregular, or continuous, but is seldom profuse. Before the menopause the first indication of hæmorrhage may be progressively increasing menorrhagia. The discharge is watery and blood-stained, and becomes offensive at an early stage. Pain is severe and occurs comparatively early ; this is probably due to the relatively rapid rate of growth. Constitutional symptoms, such as headache, sleeplessness, anæmia and loss of flesh sometimes appear early and are out of proportion to the amount of hæmorrhage and discharge ; such symptoms should arouse suspicion of malignancy without reference to the size of the uterine tumour. The marked tendency of all sarcomatous growths to necrose and become infected is well known; this results in septic poisoning, and Veit calculates that of the mortality from uterine sarcoma 85 per cent. is to be attributed directly to cachexia and sepsis.

The *treatment* consists in total extirpation of the uterus and its adnexa without delay ; the abdominal operation is preferable to the vaginal as allowing of freer removal of the broad ligaments and inspection of the other pelvic organs. The prospect of recurrence in the intra-mural form is probably about the same as in carcinoma of the uterine body ; the other varieties of sarcoma are of relatively higher malignancy.

**Endothelioma and Perithelioma of the Uterus.**—These are malignant growths arising from proliferation of the cells of the tunica interna, or the ~~tunica~~ externa of medium sized vessels, of either the blood or the lymph circulation. They possess no naked-eye characters by which they can be distinguished from other kinds of malignant growth; careful examination of the tissue by an expert microscopist is required for their recognition. These forms of malignant tumours are commoner in the ovary than in the uterus, and their histological characters will be described in the section dealing with ovarian tumours (p. 358).

## CHORIONEPITHELIOMA

It is convenient to consider this unusually interesting form of malignant tumour in connection with the uterus; but although, in the great majority of cases, the uterus is the organ primarily attacked, exceptions sometimes occur, the primary growth being found in the vagina, the labium, the Fallopian tube, or the ovary.

Its special histogenetic feature is that it arises from certain embryonic tissues, viz. the epithelial and connective tissue elements of the chorion. It is accordingly a disease which affects women who have at some time or other been pregnant; apparent exceptions to this statement will be mentioned later. The connection with pregnancy may be quite remote, several years having elapsed before the appearance of the tumour; on the other hand, it may make itself manifest during the puerperal period following an abortion or a confinement. In approximately one out of every three cases it has been found that the immediately preceding pregnancy terminated as a hydatidiform mole; when the rarity of the latter condition is borne in mind the significance of its frequent association with chorionepithelioma will be apparent.

In cases in which the primary growth was found in the Fallopian tube or ovary, it may be presumed that these organs had been the seat of an early ectopic gestation. When the primary growth is vulval or vaginal, it may be supposed that implantation of placental tissue has occurred, perhaps, upon an abrasion, which has subsequently given origin to the malignant growth.

**Pathological Anatomy.**—In the uterus the growth usually arises in the fundus and the adjacent parts of the anterior and posterior walls, i.e. in the position of the placental site (fig. 145). As a rule the uterus is symmetrically enlarged, although occasionally nodular projections due to the growth

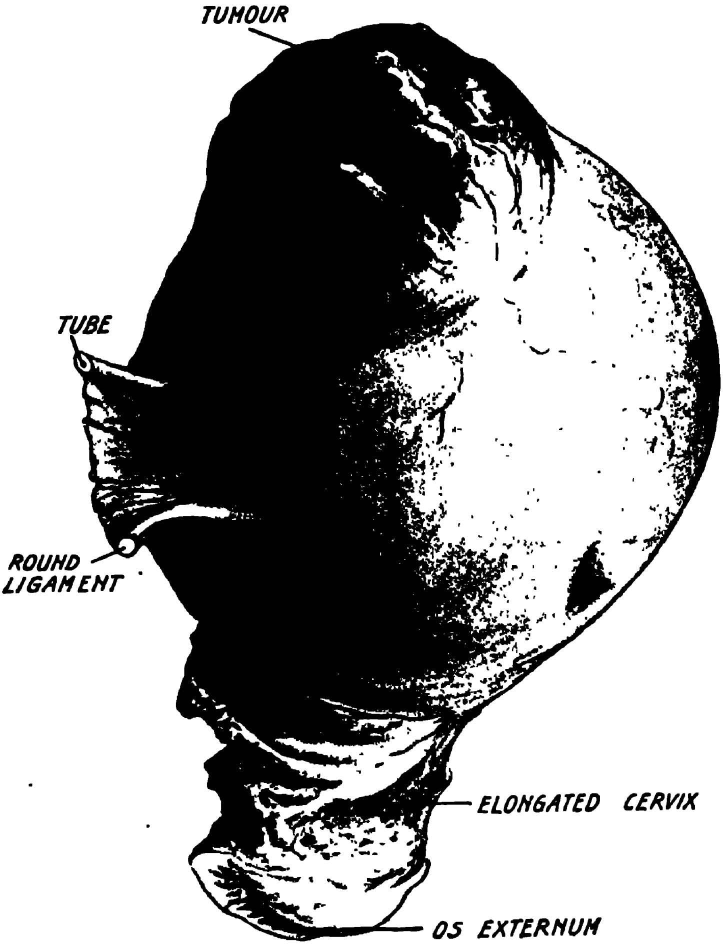

FIG. 144.—CHORIONEPITHELIOMA OF THE UTERUS. Multipara, aged 26. The uterus is enlarged, but its surface is smooth, except at the fundus. Here a nodular mass of dark-coloured growth is seen, the peritoneal covering being still intact. There is also well-marked elongation of the supra-vaginal portion of the cervix.

having reached the peritoneal surface may occur (fig. 144). The growth itself is soft, dark in colour, and freely hæmorrhagic ; its tissues are of especially low vitality, and therefore very prone to break down; consequently the older parts are generally found to consist of débris and blood clot, the characteristic elements being found only at the growing edge. These changes in the base and central parts of the tumour are well seen in fig. 145. Invasion of the fibro-muscular wall is usually visible, and isolated implantation nodules are often found in the lower part of the uterine cavity. Similar nodules, formed in the same manner, may be found in the vaginal walls and the vulva. These nodules are of a deep plum colour, soft and friable; they bleed readily when handled. The uterine growth does not attain large size, in this respect resembling corporeal carcinoma.

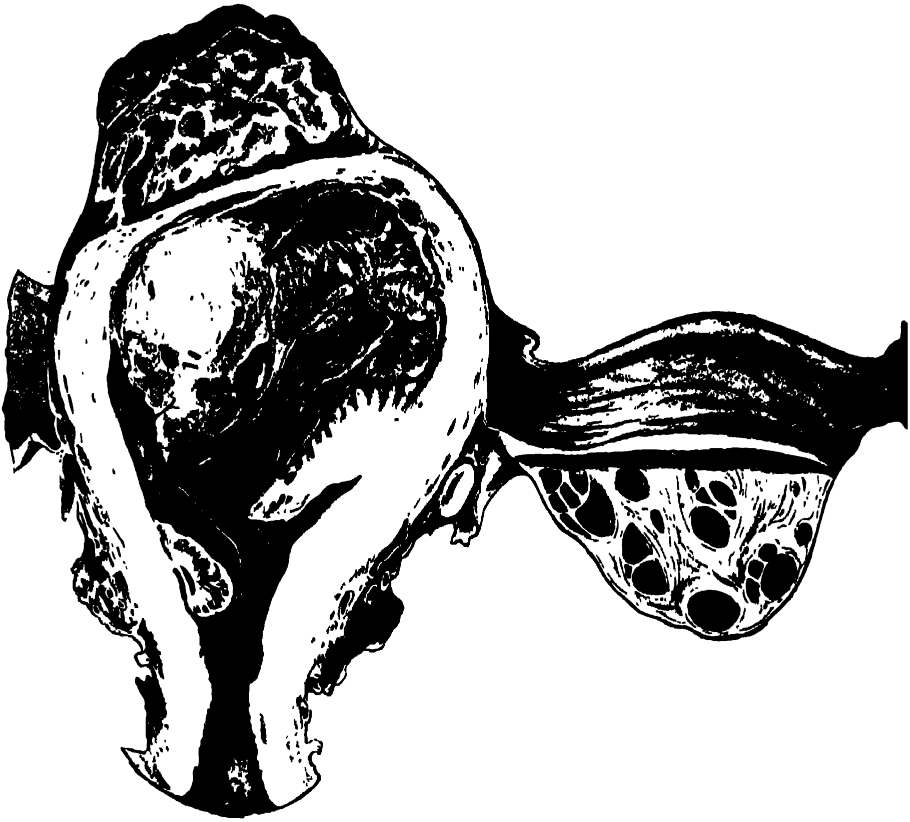

FIG. 145.—CHORIONEPITHELIOMA OF THE UTERUS. The same specimen as fig. 144. The nodular projection on the fundus probably represents an intra-mural metastasis, being separated from the root of the growth by a layer of fibro-muscular tissue. An isolated polypoid metastasis is also seen in the lower part of the uterine cavity.

In a few cases grape-like bodies, resembling the vesicles of a hydatidiform mole, have been seen in these tumours. No matter what may be the location of the primary growth, its structure and character are uniform.

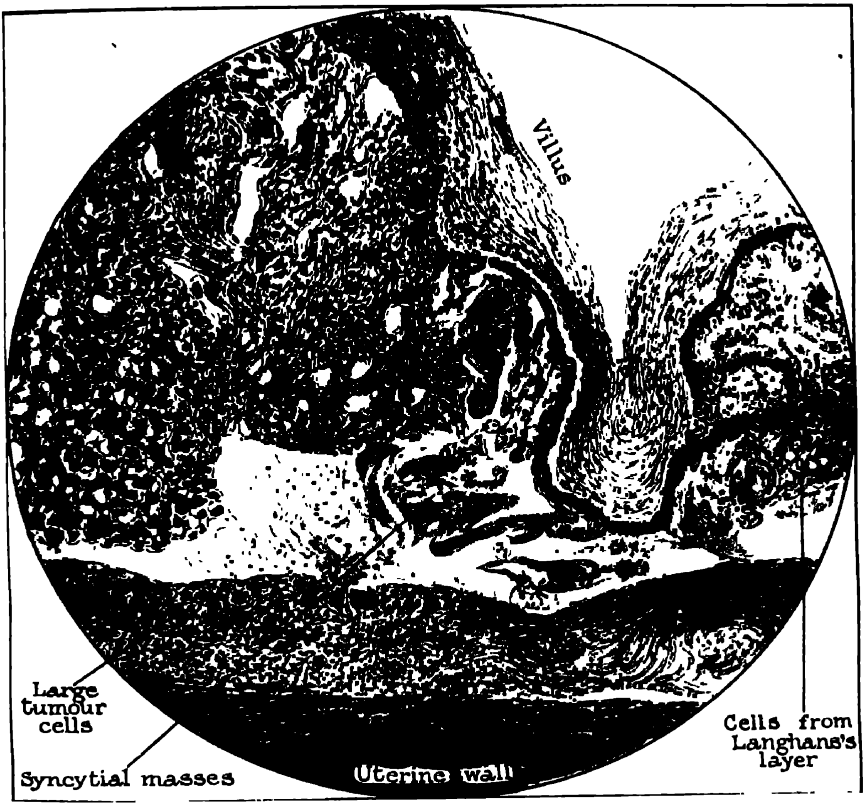

FIG. 146.—CHORIONEPITHELIOMA OF THE UTERUS (Teacher).—This section, under a low power, shows the origin of the tumour elements from a villus.

The cell elements which are typical of this tumour are the following (fig. 147): (1) large irregular multinucleated masses of protoplasm (plasmodia) in which cell boundaries cannot be recognised; these are derived from the outer layer of the chorionic epithelium or syncytium; (2) small polyhedral cells with large nuclei lying in closely packed masses; these are derived from the inner or Langhans's layer of the chorionic epithelium; (3) large mononucleated cells, and multinucleated giant cells, collected in masses, or invading the stroma of the uterine tissues; these are probably derived from both (1) and (2). In addition to these elements, definitely recognisable chorionic villi are sometimes present, either of normal appearance or in a condition of vesicular degeneration (fig. 146); the origin of the three varieties of cells just described from these villi has been traced by a number of different observers.

The tumour elements show no definite arrangement, but are mingled with one another in irregular clusters and masses, and are sufficiently characteristic to make the microscopical diagnosis of chorionepithelioma fairly simple.

Chorionepithelioma may occur at any age within the limits of possible pregnancy, a case having been recorded at seventeen and one at fifty-five. A high degree of fertility appears to entail a certain predisposition to the disease, for a relatively large proportion of cases have occurred in women who have had five or more pregnancies. In two out of every three cases the immediately preceding pregnancy terminated in abortion.

As in the case of all other varieties of malignant disease of the uterus, the earliest symptom is hæmorrhage. Usually it is severe from the first, and in this respect differs greatly from that met with in carcinoma. Not infrequently the patient also notices the passage of ' shreds ' or ' pieces ' in the discharge. In exceptional cases the amount of bleeding is not at any time considerable. More often profound anæmia results from profuse and repeated hæmorrhages. Ulceration of the growth and decomposition of the discharges, indicated by an offensive odour, occur earlier than with carcinoma and form a striking feature of the condition. To this is usually added a certain amount of fever; as a rule it is moderate, but severe rigors and other evidences of acute sepsis sometimes occur.

The degree of malignancy of the growth is variable even more than is the case with other varieties of malignant tumour. Sometimes it destroys life in a few weeks by the formation of widely diffused metastases; at other times its virulence is decidedly moderate, and radical operation has proved successful a year or eighteen months after the appearance of the first symptoms. Dissemination occurs through the blood-vessels, the cell elements of the growth

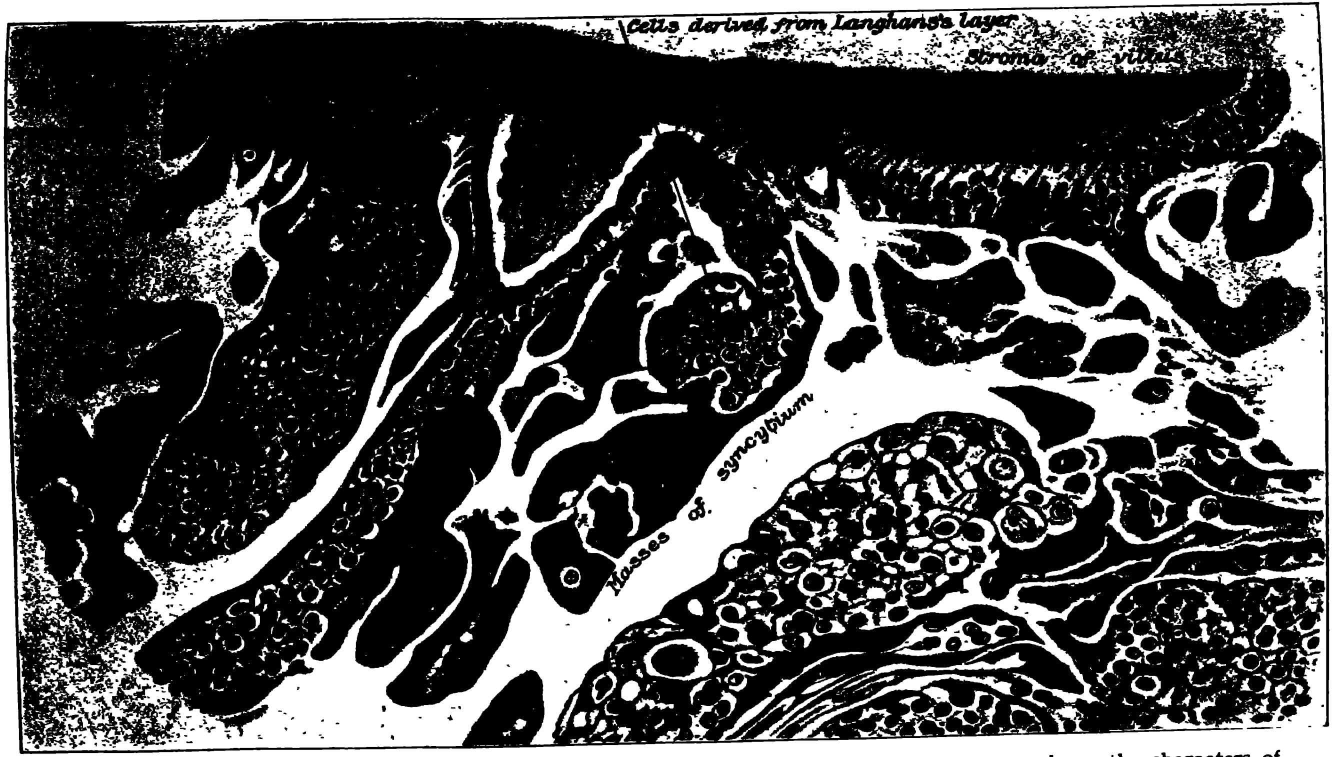

FIG. 147.—CHORIONEPITHELIOMA OF THE UTERUS (Teacher). This section, under a high power, shows the characters of the essential cellular elements of the tumour.

having been traced into efferent veins, and found in the venous channels of distant parts. The cells of this tumour possess an unusual power of eroding the walls of the vessels and so reaching the blood stream. One of the commonest positions for metastases is the lung, hæmoptysis and sometimes pleural effusion furnishing clinical evidence of the occurrence. The brain, the liver and the spleen are also often attacked; in the first-named position metastases are relatively frequent.

*Diagnosis.*—Cases of chorionepithelioma may follow quickly upon an abortion, and have been accordingly mistaken for sapræmia with retention of placental tissue, and treated as such. Both conditions are attended with hæmorrhage, a foul uterine discharge, fever, enlargement of the uterus, and the presence within it of decomposing débris of tissue or blood clot. Clearing out the uterus brings a temporary improvement in cases of chorionepithelioma, but after an interval the symptoms all recur with severity, and the uterus is again found to contain considerable masses of débris, although completely evacuated at the first operation. The rapid reproduction of decomposing tissue in the uterus under such circumstances is strongly suggestive of chorionepithelioma. Cases in which the connection with pregnancy is more remote than this may arouse no suspicion of the real nature of the condition. An enlarged uterus, giving rise to hæmorrhage and, possibly, a foul discharge, is naturally treated, in the first place, by exploration and scraping, which will result in free bleeding and in the removal of a quantity of débris. The ultimate diagnosis can then only be made by a skilled microscopist, and the whole of the tissue removed from the uterus should be sent to the pathologist with as little delay as possible.

The only possible *treatment* is extirpation of the uterus at the earliest possible moment. Owing to the serious condition in which so many of these cases come first under observation, the primary mortality of the operation has been unusually high. The prognosis as regards recurrence is not so favourable as in corporeal cancer. But in one respect the ultimate prognosis compares favourably with cancer, for in several cases the removal of the primary growth has been followed by complete disappearance of metastases in parts, such as the vaginal wall, where they could be directly observed.

## HÆMATOMETRA AND PYOMETRA: DISTENSION OF THE UTERINE CAVITY

In these conditions the uterine cavity becomes distended with blood or with a purulent fluid respectively; in the majority of cases there is an obstruction to the outflow through the cervix, but in some cases the cervix remains patulous. In some instances pyometra results from infection of the contents of a pre-existing hæmatometra, but as a rule, in the former condition, the contents are purulent from the beginning.

**Hæmatometra.**—This is due more often to *congenital obstruction*, and consequent retention of menstrual fluid, than to any other cause. The obstruction may be in the cervix itself, or in the upper part of the vagina; when the obstruction is in the lower part of the vagina the uterus rarely becomes dilated, owing to the great distensibility of the vagina, which allows it to accommodate enormous quantities of fluid. Sometimes the hæmatometra occurs in a double uterus (p. 523), the imperfectly developed half of which, though furnished with a normal endometrium, has no exit into the vagina. In 1906 Mendel was able to collect forty-one recorded cases of hæmatometra occurring under such conditions as these. More rarely an ~~*acquired obstruction*~~ in the cervix or vagina may produce hæmatometra, as in cases of extensive sloughing followed by cicatricial contraction, or by adhesion of apposed raw surfaces to one another.

Hæmatometra may be also associated with a *malignant uterine growth* which has filled up and occluded the cervical canal. Sometimes, when these tumours occur in old women, the same condition may arise without occlusion; the uterine wall, having lost its contractile power, is unable to expel the blood effused into its cavity, which accordingly becomes dilated as the hæmorrhage progresses. Hæmatometra has thus been found in connection with carcinoma, sarcoma, and chorionepithelioma. As a rule the amount of retained fluid does not exceed a few ounces, but Terillon has recorded a remarkable instance in which fifteen litres of sanguineous fluid were evacuated from the uterus in a case of sarcoma. A still more uncommon condition from which hæmatometra may also result is axial rotation of a ~~fibroid uterus~~ causing kinking of the cervical canal.

**Pyometra.**—This occurs under much the same circumstances as hæmatometra; it is, however, more often seen with malignant tumours than with stenosis. According to Bürkle it occurs in from 5 to 6 per cent. of cases of cervical cancer. It sometimes accompanies senile endometritis, especially if the uterus is also retroverted. In a considerable proportion of cases of pyometra the cervical canal remains patent, and the accumulation of fluid is due to loss of contractile power in the uterine wall. Pyometra is frequently accompanied by double pyosalpinx and general pelvic inflammation, owing to spread of the infection from the uterus.

The retained fluid is usually a thin offensive pus, from which the bacillus coli has frequently been cultivated, but which in some instances has proved sterile. Sometimes interstitial abscess formation in the uterine wall is also found.

**Clinical Features.**—Primary amenorrhœa is the distinguishing feature of cases of hæmatometra associated with congenital stenosis, if the uterus is single. When the uterus is double, menstruation may occur normally through the unaffected half of the organ, and the swelling formed by the hæmatometra, in close association with what may appear to be a normal uterus, naturally gives rise to great difficulty in diagnosis. Cases associated with malignant growths are frequently overlooked, as they only occur in an advanced stage of the disease. When the cervix remains patent, intermittent profuse discharges of blood or pus may occur. Acute abdominal pain, fever and rigors or sweating, when present, may be taken to indicate that the uterine contents are purulent, but these symptoms may be absent.

**Treatment.**—In cases of *hæmatometra* due to congenital occlusion the uterus should, if possible, be evacuated through the vagina; if, however, the tubes are also distended and the clinical evidence points to the presence of suppuration, a radical operation is indicated. In cases of *pyometra* due to senile endometritis, the cervix should be dilated, the uterus cleared out and curetted, and then swabbed with pure carbolic acid, and drained with a strip of gauze passed through the cervix and changed daily; vaginal hysterectomy is indicated in cases which resist this treatment. When associated with a malignant growth, the treatment is determined solely by the extent and operability of the disease.

# PART VI

## MORBID CONDITIONS OF THE OVARIES

| | |
|---|---|
| Ovarian Neuralgia | Hæmatoma |
| Displacements | New Growths |

### OVARIAN NEURALGIA

Women not infrequently complain of chronic pain referred to the iliac region on one side or the other, or sometimes on both sides; this area is often somewhat loosely styled the 'ovarian region.' The left side is much more frequently affected than the right, and in the majority of cases the subjects of this pain are women of pronounced nervous temperament. The ovary may be found somewhat enlarged and more sensitive than usual to pressure in the bimanual examination, but without restriction of its mobility. In other cases the ovary may be felt to be of abnormally small size. In a small proportion of such cases some of the signs of inflammation, affecting the Fallopian tube and ovary on the same side as the pain, may be found on internal examination; more often these signs are absent. An enlarged painful ovary, when examined after opening the peritoneal cavity, is often found to contain a number of small follicular cysts (see p. 327), a condition which is equally common in the case of ovaries which are not painful. The small painful ovary is usually found to be of abnormally dense consistence, with numerous deep puckerings such as are commonly found in the ovaries of women who are approaching the close of the fertile period of life. These ovaries have been called 'cirrhotic,' since they contain an abnormally large proportion of well-formed fibrous tissue; the pain is attributed in some

~~way to the~~ effects ~~of the formation of~~ this excess of fibrous tissue. But it must be recollected that analogous changes occur in the ovary under normal conditions in connection with the menopause, and at such times ovarian pain is not a ~~marked or constant~~ symptom.

The proper view to take of chronic ovarian pain is that it is a neurosis, and is not dependent upon any structural changes which our present methods of examination can detect. ~~Care should be taken~~ by thoroughly examining the pelvic organs, under anæsthesia if necessary, to exclude inflammatory changes such as those which will be described on p. 426. When these can be definitely excluded the case should be regarded and treated solely as a neurosis.

Local treatment and all internal manipulations should be avoided, and the general management suitable to cases of neurasthenia should be relied upon. Removal of the ovaries, in the absence of definite morbid changes in them, is highly inadvisable.

## DISPLACEMENTS OF THE OVARY

Congenital *non-descent* of the ovary is a very rare anomaly, but a few cases have been recorded in which the ovary has been ~~detained above~~ the pelvic brim in the neighbourhood of the ureter (Bland-Sutton).

As a result of *inflammatory changes* ovaries may be found displaced and adherent to the fundus or back of the uterus, to the ovary or tube of the opposite side, or to the floor of the utero-vesical pouch.

**Prolapse of the Ovary.**—In this condition one or both of the ovaries lie in the para-rectal pouch or in the pouch of Douglas. This displacement is a common result of backward ~~displacement of the uterus~~ (see p. 157), but also often occurs as an independent condition. In the latter case there are two determining causes, viz. relaxation of the ovarian supports, usually the result of pregnancy, and enlargement with increase in weight of the ovary. These conditions lead the ovary to sink first into the para-rectal pouch and later, slipping over the edge of the utero-sacral fold, to fall into the pouch of Douglas. At first the ovary, though usually enlarged, is not otherwise abnormal; after a time it may become adherent in its faulty position from the occurrence of plastic peritonitis. Except in cases of retroversion the condition is usually unilateral, or if bilateral one ovary is affected to a much greater extent than the other.

The main *symptom* of a prolapsed ovary is a dull aching pain felt in the back or in the hypogastric zone of the abdomen, and when the condition is associated with backward displacement of the uterus other symptoms may be present (see p. 158). In its abnormal position in the pouch of Douglas the ovary is subject to disturbance from the filling and emptying of the rectum, from straining during defæcation, or from coitus. In its normal position it is protected almost entirely from disturbances of this kind. These considerations probably account for the fact that the majority of prolapsed ovaries are very sensitive to touch *per vaginam* or *per rectum*, and to this abnormal sensitiveness the pain so often experienced is due. Yet cases are not very infrequent in which prolapsed ovaries are not unduly sensitive and do not give rise to pain, but are discovered as it were by accident during clinical examination. The pain is increased during menstruation, but beyond being unusually painful this function is not otherwise disturbed. Married women sometimes complain of dyspareunia, the pain in some cases being described as severe and sickening in character.

As is the case with many other minor gynaecological ailments, neurasthenia and hysteria are frequently found in association with prolapsed ovaries. Care must be exercised in avoiding the error of attributing all the patient's alleged sufferings in such cases to the displaced ovary.

The *treatment* of a prolapsed ovary is a subject which calls for the exercise of discretion, especially if complicated by obvious neurosis. *Relief* of pain can sometimes be secured by a course of local treatment, such as rest, vaginal douching and vaginal tamponade (see p. 615); rest in such cases should be enforced in the prone position or on the side opposite to that to which the affected ovary belongs. These measures may temporarily relieve the embarrassed circulation through the ovary. A ring pessary will limit the descent of the ovary, although it is powerless to restore it to its normal position. Only a certain amount of relief can be anticipated from the use of this instrument. Cure can be obtained by stitching up the ovary in its proper position, either by shortening the ovarian ligament or by stitching the mesosalpinx to the parietal peritoneum at the level of the pelvic brim.

In cases dependent upon backward displacement, the treatment is that suited to the displacement, and nothing more.

**Hernia of the Ovary.**—This condition may be *congenital* when the ovary occupies the canal of Nuck; in many reputed cases, however, the body found in this canal has proved on microscopic examination to be a testis, or a combined gland—ovo-testis (see p. 531). The *acquired* form is much commoner than the congenital; the ovary has been found in every variety of hernia, but more commonly in the inguinal than in any other. It is usually accompanied by its companion Fallopian tube, and sometimes by a knuckle of bowel or a piece of omentum. Ovaries displaced in this way are usually functionally active. The gland often becomes swollen and unusually tender during menstruation, and in rare instances axial rotation has occurred, giving rise to acute symptoms and to a diagnosis of strangulation of the hernia. When the ovary cannot be reduced the case should be treated surgically upon the lines suited to the variety of hernia which it represents.

## HÆMATOMA OF THE OVARY

Hæmorrhage into the substance of the ovary may occur in one of two forms, viz. *circumscribed* and *diffused*. In the former the effused blood is enclosed within a definite cyst wall, representing the wall of a Gräafian follicle, or of a corpus luteum, which may become greatly enlarged as in fig. 148, either by distension, or by fusion of contiguous follicles. In the latter the blood infiltrates the general ovarian stroma, affecting a portion of, or sometimes the entire, ovary. The remains of a follicle, from which the bleeding may have occurred, can usually be found in some part of the ovary. In both forms the source of the bleeding appears to be the same, viz. the follicle either in its ripening or its retrogressive phase. Hæmorrhage occurring into the loculi of a cystic tumour, and ovarian pregnancy, are not included under this designation.

An ovary affected by hæmorrhage is enlarged, of a deep purple colour and a globular shape; it seldom exceeds the size of a hen's egg. When the hæmorrhage occurs suddenly, acute abdominal symptoms resembling those of appendicitis may occur; more often the hæmorrhage is gradual and a long history of menorrhagia and pelvic pain is obtained. The hæmorrhage is spontaneous, not traumatic, and nothing further can be said in explanation of its occurrence. Exact diagnosis is not possible until after removal of the affected ovary; the exclusion of ovarian pregnancy can only be made by microscopic examination (p. 451).

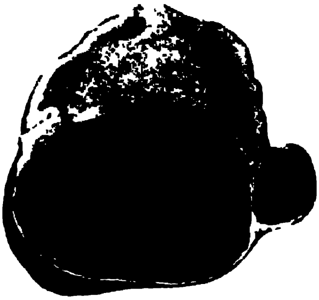
FIG. 148.—FOLLICULAR HÆMATOMA OF THE OVARY (Charing Cross Hospital Museum).

**Inflammation of the ovary** will be considered in the section dealing with 'Pelvic Inflammation' (p. 417).

## TUMOURS OF THE OVARY

The tumours which occur in the ovary may be pathologically classified as follows:—

A. *Epithelial Growths:*
  Follicular cysts.
  Corpus luteum cysts.
  Cyst-adenomata.
  Papilliferous growths—
    (1) Cystic.
    (2) Surface papillomata.
  Racemose cysts.
  Carcinomata—
    (1) Primary.
    (2) Secondary.

- B. *Connective Tissue Growths :*
  - Fibromata.
    - Adeno-fibromata.
    - Fibro-myomata.
  - Sarcomata.
  - Endo- and peri-theliomata.
- C. *Complex Growths :*
  - Dermoid Cysts.
  - Teratomata.
- D. *Parovarian* Cysts.

In considering the pathological anatomy of the ovarian tumours it will be convenient to follow this classification. In considering, later on, their clinical features, it will be necessary to adopt a simpler method, for the reason that the recognition of the nature of an ovarian tumour is, as a rule, impossible until it has been removed from the body and examined. From the clinical standpoint the important matters to consider are whether the growth is cystic or solid, and in each case, whether it is innocent or malignant.

## PATHOLOGICAL ANATOMY OF OVARIAN TUMOURS

Epithelium exists in the ovary in four different forms: (*a*) as *germ epithelium* which covers the surface of the ovary; (*b*) in the Gräafian follicles as *follicular epithelium*—cells of the membrana granulosa and discus proligerus; (*c*) in the medulla and hilum in the form of solid epithelial processes, the *medullary cords* of Kölliker; (*d*) as *primordial ova.*

Tumours of epithelial origin arise from epithelial cells already present in the ovary, i.e. from one of the four kinds just mentioned. The greater number of such tumours are cystic, and cystic tumours form by far the largest class of ovarian new growths. The following varieties of cystic tumours occur in the ovary :

1. Follicular cysts : hydrops folliculorum.
2. Corpus luteum cysts : lutein cysts.
3. Cyst-adenomata : proliferating or multilocular cysts.
4. Papilliferous cysts.
5. Racemose cysts.
6. Dermoid cysts.
7. Parovarian cysts.

**Follicular Cysts : Hydrops Folliculorum.**—The occurrence in the normal ovary of small cystic spaces formed by degeneration and non-rupture of Gräafian follicles has been already referred to (p. 41). The mode of formation of these cysts is indicated in figs. 149 and 150. The former shows a Gräafian follicle from a normal ovary, which has lost its ovum cell, and is lined by a single layer of low cubical cells representing the membrana granulosa. This figure may be compared with fig. 28, which represents a normal follicle in the resting stage. The follicle shown in fig. 149 is probably an aborted follicle, i.e. one which will not ripen, and may undergo further degeneration. Fig. 150 shows another follicle from the same ovary; it has become irregularly enlarged by accumulation of fluid in its interior, its epithelial lining has become atrophied, and the component cells degenerated so that their outlines are barely discernible. This represents an early stage in the formation of a follicular cyst; further enlargement will cause the follicle to bulge upon the ovarian surface and to become visible to the naked eye. When a large number of such cysts occur in the ovary, destroying the greater part of its substance and considerably enlarging its size, the condition becomes pathological.

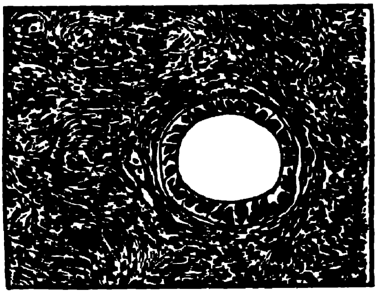
FIG. 149.—GRÄAFIAN FOLLICLE FROM AN ADULT OVARY. The ovum is lost and only the membrana granulosa remains; probably an aborted follicle.

The cysts are multiple and originally quite distinct from one another; they are thin-walled, contain clear yellowish fluid, and are lined by an imperfect layer of somewhat flattened epithelium. It is possible that contiguous cysts may become fused by atrophy of the partition between them; but the characteristic feature of the condition is the occurrence of multiple unilocular cysts, separated from one another by ovarian tissue. Ovaries thus affected seldom attain a size exceeding that of a golf ball or a small orange, and they are usually clinically termed *cystic ovaries*. It will be obvious that the line of demarcation between this condition and that described as occurring in *normal ovaries may be difficult to determine. This form* of cyst is of little clinical importance and probably gives rise to few, if any, symptoms. Such ovaries should not be removed as long as any considerable portion of ovarian tissue remains unaffected ; they should be treated by conservative resection of the cystic portions.

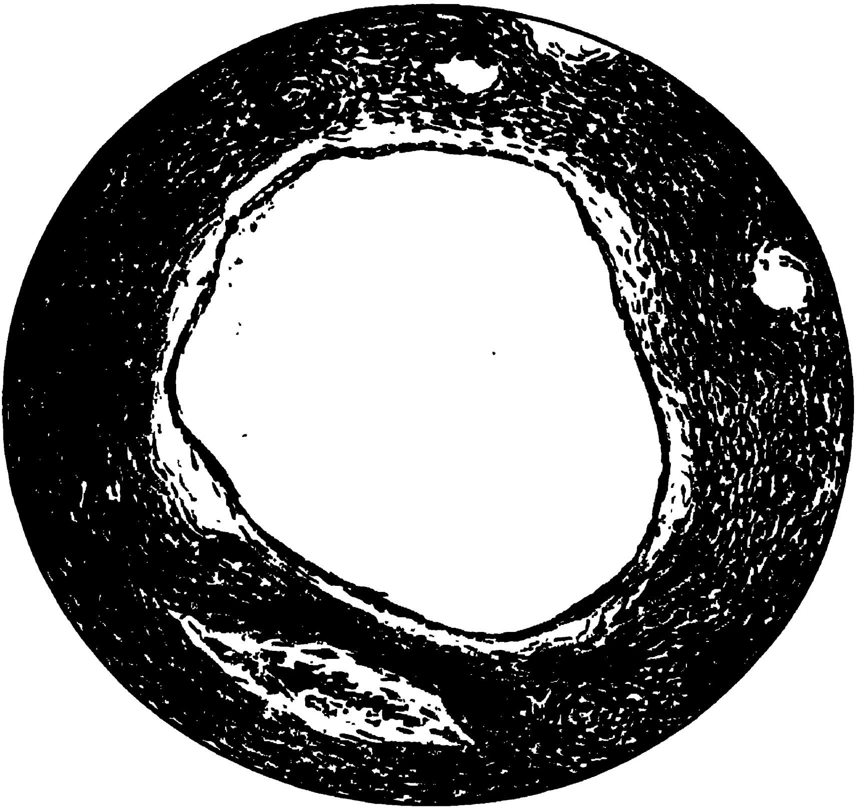

FIG. 150.—FOLLICULAR RETENTION CYST (Hydrops Folliculorum). The section shows an irregular dilated follicle with its epithelial lining atrophied by pressure.

**Corpus Luteum Cysts.**—These cysts are due to undetermined pathological changes occurring in follicles which have ruptured, and are in process of repair. As a rule they are single cysts, but there may be several in the same ovary, and it is rare for them to form tumours of large size, although an example has been described as being the size of a man's head. They differ from the preceding form of cyst in ~~having thick walls~~, which in the case of small cysts are definitely convoluted like the wall of the healing Gräafian follicle (fig. 31). In the larger cysts the convolution is lost by excentric pressure. Their contents are clear, colourless, and rich in albumen. The thick wall consists of condensed

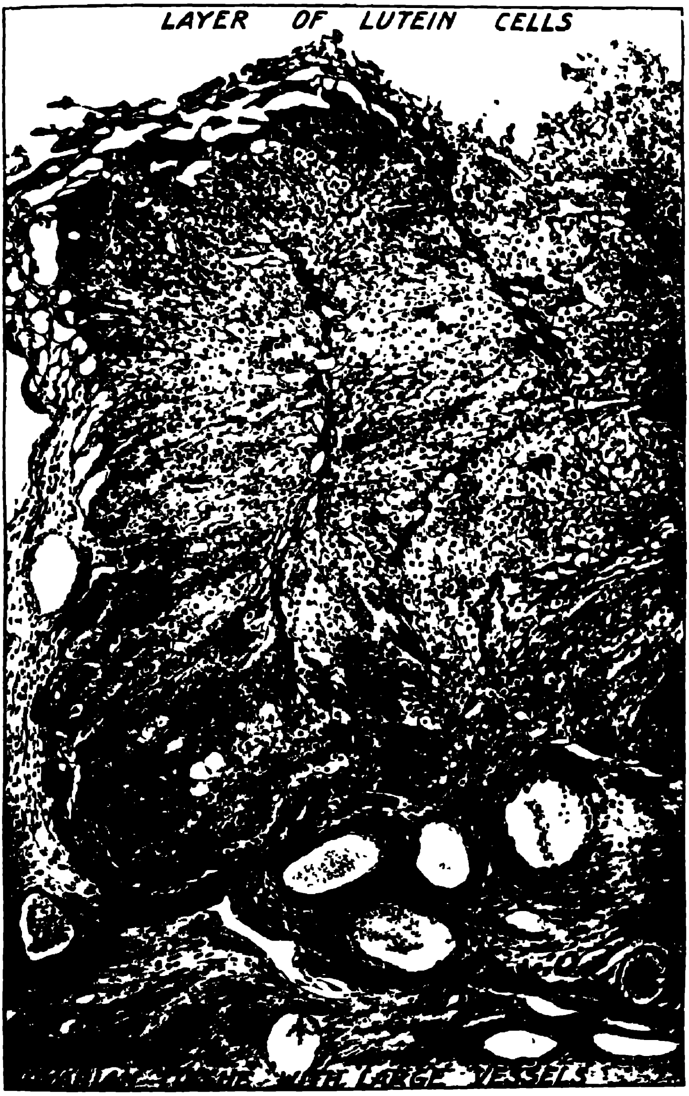

FIG. 151.—WALL OF A SMALL LUTEIN CYST. The lutein tissue consists of closely aggregated polygonal cells with globular nuclei.

ovarian stroma, within which is found, in small cysts, a thick layer of lutein cells and fibrin, and this layer it is which shows convolution (fig. 151). In larger cysts the layer of lutein cells is much reduced in thickness. Sometimes an incomplete layer of imperfect columnar epithelium, representing membrana granulosa cells, may be found. Like follicular cysts, these tumours are of little practical importance and of comparatively rare occurrence.

**Cyst-adenomata: Proliferating Multilocular or Pseudo-mucinous Cysts.**—These are by far the commonest form of ovarian cyst and may attain an enormous size, representing the largest tumours ever met with in the body. The amount of fluid contained in them may also be very large; the tumour from the case shown in fig. 181 contained sixteen and a quarter gallons. Owing to the safety of ovariotomy at the present time, these tumours are usually removed as soon as recognised, and thus are not allowed time to attain their full size. They are usually unilateral, although many exceptions to this rule occur.

Cyst-adenomata have been held to arise from Gräafian follicles, but the evidence is now fairly conclusive that they arise from the germ epithelium. Walthard first pointed out that collections of actively proliferating epithelial cells derived from the germ epithelium sometimes occurred in the cortex of a healthy ovary, and that in some instances tubular structures lined with a cubical or cylindrical epithelium were to be found in a similar position. His observations have been confirmed, among others, by Williamson and Louise McIlroy in this country. A good example of these structures is to be seen in fig. 152; the irregular, epithelial-lined spaces shown in the figure lay in the superficial part of the cortex, and by serial sections it was found possible to trace them into direct connection with the surface of the ovary, where they arose in the form of slender tubular prolongations of the germ epithelium into the cortex. After penetrating the ovarian substance the germ epithelium became columnar and showed great activity; the formation of epithelial buds upon the walls of the spaces is seen in the figure. Not only has the epithelium changed from cubical to columnar but the cells in the larger spaces, in many cases, are distended with mucin, and closely resemble in general characters the epithelium found in a cyst-adenoma (compare figs. 152 and 154). There can be no doubt that this represents the actual mode of origin of these tumours.

A cyst-adenoma forms a pediculated tumour which has completely replaced the ovary. It has no capsule and rides free in the peritoneal cavity. Its *surface*, when unaltered by secondary changes, is smooth, polished, and of a bluish colour. Small tumours preserve more or less the oval shape of the parent organ and usually lie in the pouch of Douglas. Sessile elevations or bosses are sometimes seen upon them. Large tumours are of varied and often quite irregular shape, sometimes definitely nodular or lobulated. On *section* the tumour is seen to be composed of a large number of constituent chambers, separated from one another by well-formed partitions (fig. 153). In small tumours these chambers are usually of fairly equal size; in large tumours there is generally one cavity, or it may be more than one, of

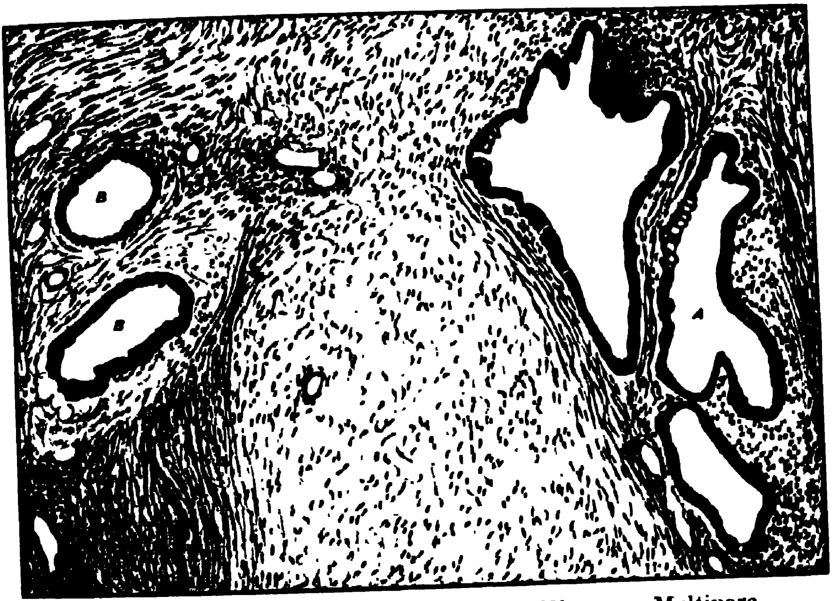

FIG. 152.—HEALTHY OVARY OF AN ADULT WOMAN. Multipara, aged 40. The epithelial-lined spaces (A and B) illustrate the origin of the cyst-adenoma; their connection with the germ epithelium was traced in serial sections. The epithelium is columnar and in the space marked (A) contains a number of mucin bearing goblet cells.

predominating size to which the great bulk of the tumour is due. The growth is from the beginning multilocular, and

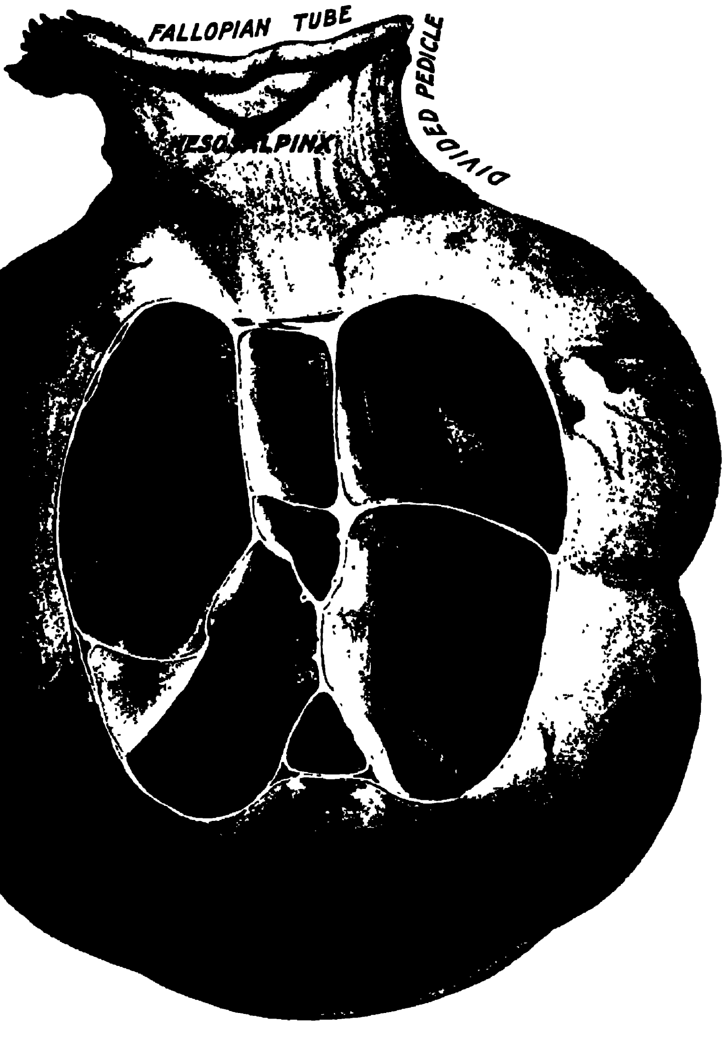

FIG. 153.—CYST-ADENOMA OF THE OVARY (Charing Cross Hospital Museum). A portion of the cyst wall has been removed to show the multilocular character of the tumour. The ridges seen in the interior are traces of broken-down septa.

the large chambers are formed by atrophy and disappearance of the septa between adjacent chambers; ridges are often to be seen on the walls of such large spaces indicating the positions from which septa have disappeared (fig. 153).

Occasionally a large tumour is seen to be composed of a very large number of small cavities and appears for that reason to be almost solid. Some writers have distinguished it as 'adenoma' of the ovary, but its structure is not in reality different from those which are more definitely cystic. The cyst-wall consists of a fairly dense and well-formed vascular fibrous tissue, which has no outer epithelial covering, the original germ epithelium of the ovary being lost, in all but the smallest tumours, by friction and expansion. In the septa separating the compartments the connective tissue is much looser and very vascular. The lining epithelium can best be studied in the small cavities where its original characters are unaltered. Here it is seen to consist of high columnar cells with large oval or globular nuclei situated at their base (figs. 155 and 156). In some cases the

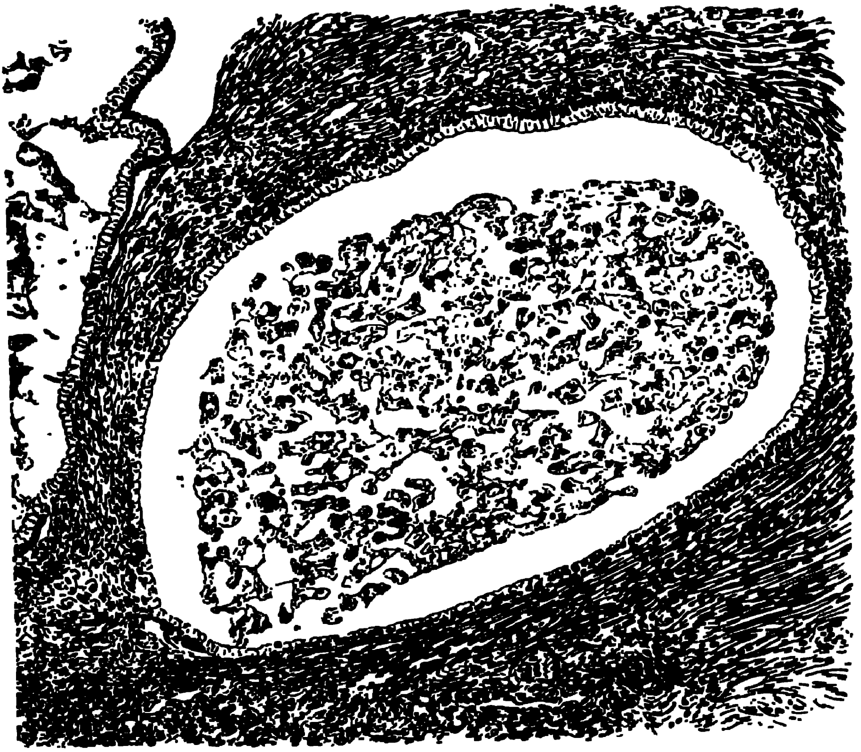

FIG. 154.—CYST-ADENOMA OF THE OVARY. Showing a loculus with its epithelial lining and the septa composed of well-formed fibrous tissue.

cells are of great height forming what is known as palisade epithelium. There is usually a single layer of cells only, which rest upon a definite basement membrane ; occasionally there is a double layer of cells. There are many goblet cells present, swollen with secretion which can be seen pouring

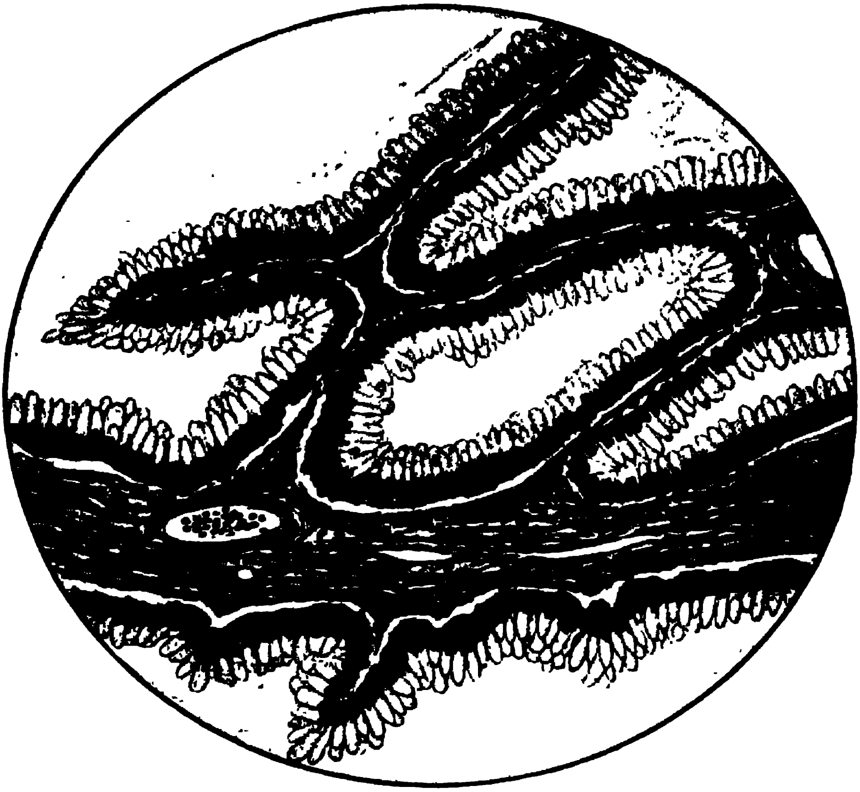

FIG. 155.—CYST-ADENOMA OF THE OVARY. Showing the high columnar epithelium found in the smallest loculi. A double layer of cells is seen in most parts.

into the spaces. In the small ~~compartments active budding~~ processes can be detected, growing usually towards the centre of the space (fig. 155). Aggregations of small proliferating epithelial spaces are in this manner frequently formed upon the walls of these cysts, forming rounded projections which may be palpable clinically when large enough to protrude upon the outer surface, but are more commonly found upon the inner wall. In the larger cavities the epithelium is usually cubical, and in the largest spaces of all it becomes flattened or may be completely lost; this

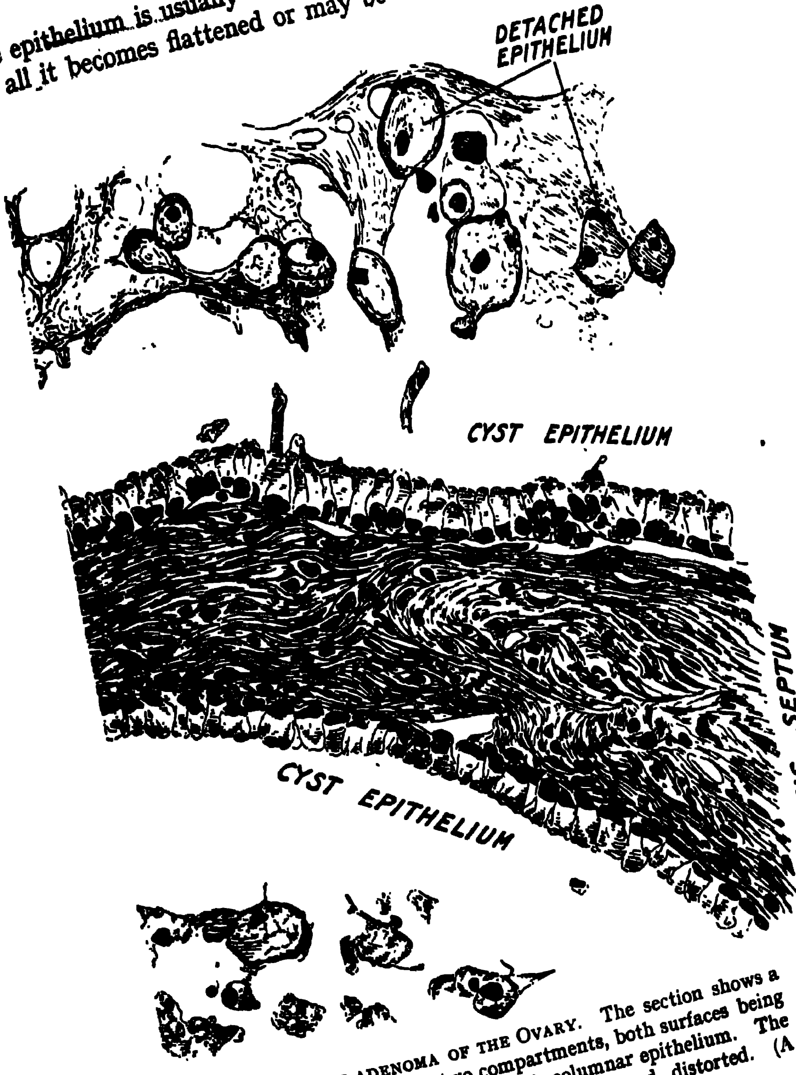

FIG. 156.—CYST-ADENOMA OF THE OVARY. The section shows a septum between the two compartments, both surfaces being lined with a single layer of high columnar epithelium. The detached epithelial cells are swollen and distorted. (A portion of fig. 154 more highly magnified.)

results partly from the increasing pressure of the cyst contents, partly from hæmorrhage and degenerative processes. Many of the epithelial cells become detached and lie free.

in the cyst fluid; by imbibition they increase greatly in size and become globular or quite distorted in shape (fig. 156). In the smaller spaces detached and degenerated epithelial cells exist in considerable numbers.

Cyst-adenomata grow by proliferation of their epithelial and connective tissue elements. In this manner clusters of small cysts are formed, either in the outer wall or in the interlocular septa, known as 'daughter cysts.' The increase in size of a given tumour accordingly depends in part upon epithelial proliferation giving rise to fresh cysts, and in part upon the accumulation of their fluid contents.

The *fluid contents* of ovarian cyst-adenomata are subject to considerable variation. In the smallest spaces the fluid is thick and gelatinous, and may be sufficiently solid to be cut with a knife; it is colourless, alkaline in reaction, and contains a characteristic body peculiar to this form of cyst, known as pseudomucin. Hence these tumours are sometimes called 'pseudomucinous cysts.' The clear colourless fluid found in the smallest cysts consists of pure pseudomucin; the thin turbid fluid found in large loculi contains a great deal of albumen and little pseudomucin. This body is a glyco-proteid, as it reduces copper sulphate in alkaline solution. It differs from mucin in not being precipitated by acetic acid, and from albumen in not being precipitated by boiling or by the mineral acids (Pfannenstiel). In the larger spaces the fluid is thinner, turbid, and highly albuminous; it shows considerable diversity of colour, which results from hæmorrhage into the cyst cavities and subsequent alterations in the blood pigment. Various shades of yellow, green, and brown may in this way be produced, and the fluid may be either viscid or quite watery in consistence. The tendency to the occurrence of slight hæmorrhage is very common, and it is rare to find a large cyst without this pigmentation of its contents. The specific gravity of the fluid is always high, and in the larger cavities varies from 1010 to 1030. Under the microscope, degenerated epithelial cells, leucocytes, and a good deal of débris will be found. Sometimes cysts of large size contain only jelly-like contents; they are often called *colloid cysts*, and they deserve a special designation on account of the marked tendency of the wall to become softened and thinned by degenerative changes, and accordingly to undergo spontaneous rupture.

The source of the cyst contents may be said to be threefold: (1) secretion from the epithelial lining; (2) degenerated and detached epithelium; (3) capillary transudation or hæmorrhage.

Occasionally cyst-adenomata contain a thin yellowish, serous fluid, in which no pseudomucin is present. These are sometimes distinguished as *serous cyst-adenomata*, but their contents are highly albuminous, although the albumen is of a different kind from that found in the commoner variety. The epithelium of these cysts is said to be ciliated.

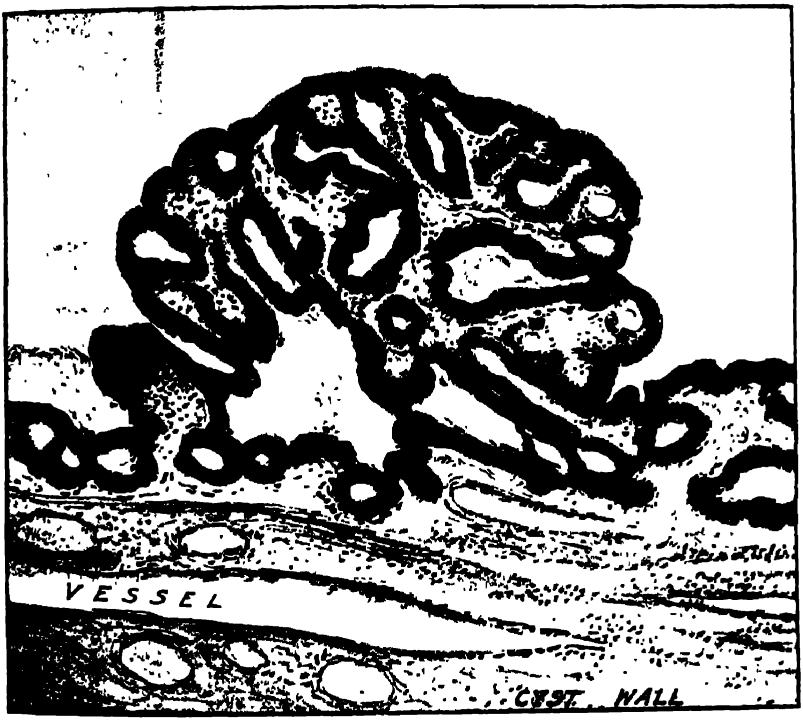

FIG. 157.—PAPILLIFEROUS CYST OF THE OVARY. A simple papilla showing the connective tissue core, the epithelial covering, and the numerous epithelial invaginations.

*The Ovarian Pedicle.*—The great majority of ovarian cysts are pediculated; a few are sessile, and these will be referred to later. The pedicle attaches the tumour to the uterus and to the floor of the pelvis, and consists of (1) the

Fallopian tube and mesosalpinx; (2) the ovarian ligament; (3) the infundibulo-pelvic fold; (4) the broad ligament included between (2) and (3) (see fig. 17). In the case of small tumours the Fallopian tube and mesosalpinx are unaltered (fig. 153); in the case of large tumours, the tube may become stretched over the tumour and greatly elongated so as to measure from ten to twelve inches in length, and in such circumstances the mesosalpinx disappears. Also, in large tumours the ovarian ligament becomes greatly stretched and is barely recognisable. Through the infundibulo-pelvic fold the ovarian artery passes, therefore upon this portion of the pedicle the main vascular supply of the tumour depends. Another smaller artery, the anastomotic branch of the uterine, reaches it in close relation to the ovarian ligament, so that the blood supply of the tumour comes in at the two lateral extremities of its pedicle. In the case of a large tumour the ovarian artery attains a great size.

It is rare to find the ovarian pedicle more than two or three inches long; but at times it may be twice that length, allowing the tumour to become so much displaced upwards into the abdominal cavity as to cause some confusion in clinical diagnosis. Unless altered by pathological conditions, the pedicle is thin and membranous. In this it differs greatly from the pedicle of a stalked subperitoneal fibroid (see fig. 105). Not all ovarian cysts are pediculated. A certain number are sessile, and these are generally found to have grown in between the layers of the broad ligament in the manner commonly associated with parovarian cysts (see p. 367). At times they burrow extensively beneath the peritoneal covering of the pelvic floor, and can only be removed by enucleation. This condition is more common in the case of papilliferous cysts than with other varieties. From inflammatory changes, small cysts may become firmly adherent to the posterior surface of the broad ligament; they are then detained in the pelvic cavity and are virtually sessile, although, by separating the adhesions, the anatomical pedicle can be disclosed.

**Papilliferous or Papillary Cysts** (Cyst-adenoma pseudomucinosum invertens of German writers):—Certain ovarian cysts are characterised by the formation of warty excrescences (papillomata) upon their inner surface. In some cases excrescences of this kind may be found, in small numbers, in one or more loculi of an ordinary cyst-adenoma. In the papilliferous cyst they are widespread and form a characteristic feature of the whole tumour. In such cases other points of difference from the cyst-adenoma may be noticed. Thus papilliferous cysts are frequently unilocular, while the cyst-adenoma is always multilocular; they seldom attain a very large size, they are commonly bilateral, and are sometimes accompanied by ascites. Their walls are thick and of a dull whitish colour, their contents are comparatively thin and are less albuminous than those of a cyst-adenoma. Not infrequently they grow between the layers of the broad ligament, so that the normal ovarian pedicle is not formed and the tumour remains sessile. Their epithelium is usually cubical or low columnar, the high columnar cells characteristic of the cyst-adenoma being seldom seen (figs. 157 and 160).

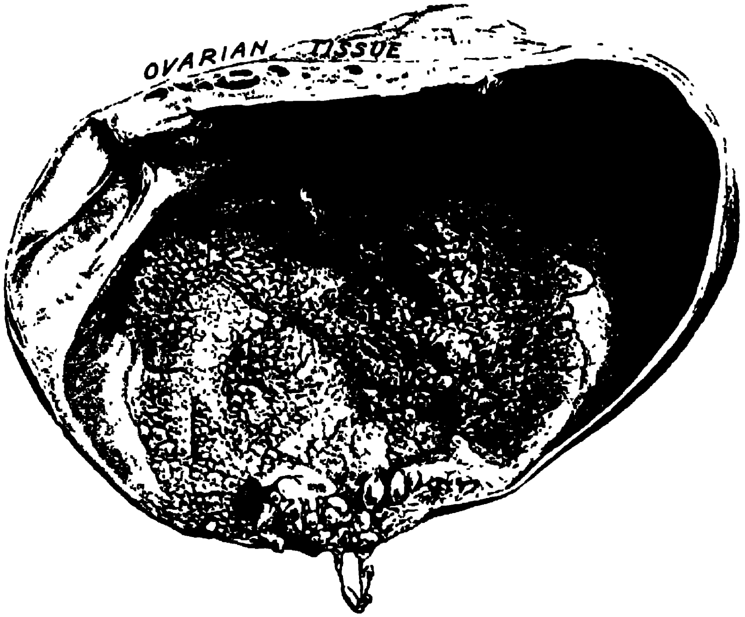

FIG. 158.—PAPILLIFEROUS CYST OF THE OVARY (Royal College of Surgeons Museum). The cyst is unilocular, and its inner surface is thickly studded with warty masses. A certain amount of ovarian tissue, bearing Gräafian follicles, has persisted.

The papillomata consist essentially of a delicate connective tissue core with an epithelial covering, and they are formed by direct outgrowth from the cyst wall. To the naked eye they appear individually as small wart-like projections with an irregular surface (fig. 177). They may be diffused widely in small clusters over the cyst wall, or being collected in larger groups they may form tuberous masses resembling a cauliflower. Sometimes they thickly cover nearly the whole wall of the cyst (fig. 158). Structurally they present two types. In the first type (simple papillae) the papillae are inactive; they form shallow rounded projections, and consist of a delicate fibrous tissue core, with an epithelial covering showing numerous shallow invaginations,

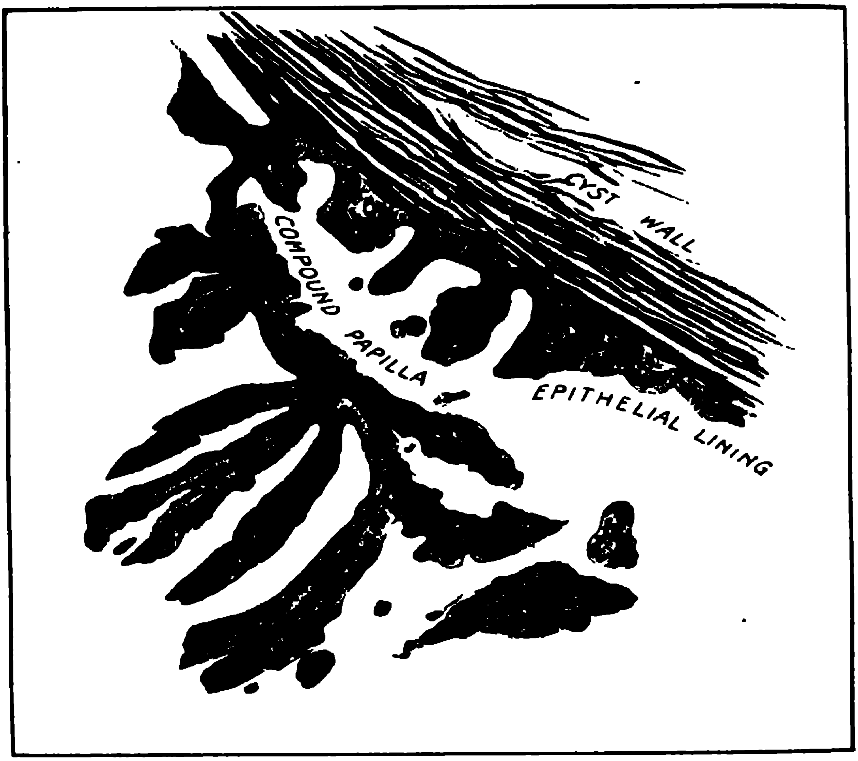

FIG. 159.—PAPILLIFEROUS OVARIAN CYST. Showing the origin of the papillae from the cyst wall. Numerous buds and processes are thrown out by the epithelium. (Semi-diagrammatic.)

composed of a single layer of cubical cells (fig. 157). In the second (compound papillae) the papillae are very active; they consist of an aggregation of sinuous, compound, branching processes, composed of a core of delicate connective tissue and an epithelial covering of a single layer of low columnar cells (figs. 159 and 160).

The papillary cysts in some cases display a degree of proliferative activity of their epithelial elements which brings these tumours up to the border-line of malignancy. Thus the papillae may perforate the cyst wall and appear upon the outer surface, where they not only spread thickly upon the tumour but also invade the adjacent peritoneum. They may then be found growing upon the back of the uterus or upon the tube and ovary of the opposite side, as in fig. 161. In other instances they may be found widely disseminated in nodules or clusters over the peritoneal membrane. The same result may occur from traumatic rupture of a papilliferous cyst. Peritoneal implantation probably arises in the latter case from detachment of living

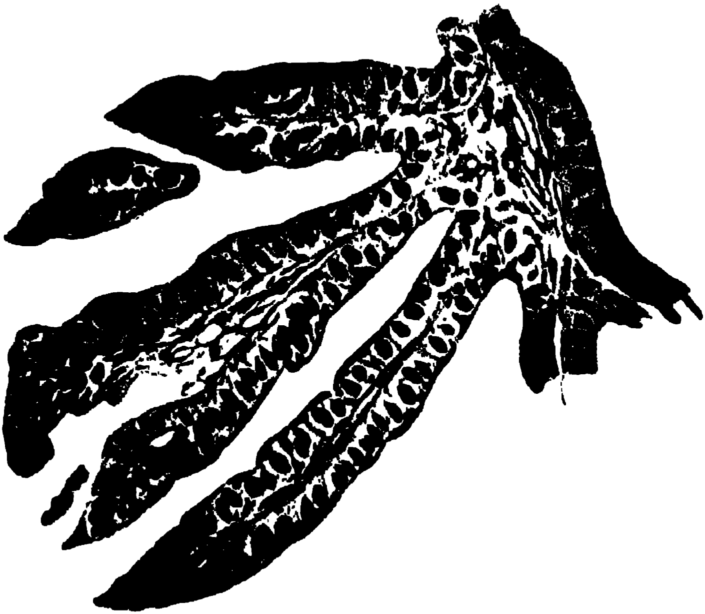

FIG. 160.—PAPILLIFEROUS OVARIAN CYST. The section shows the structure of a compound papillae, with its single layer of epithelial cells.

epithelial elements, which may become transferred by peritoneal currents or by gravity to remote parts of the abdomen, where they grow as parasites. But when once the growth has escaped from the limiting cyst, there appears to be no end to the possibilities of its dissemination, and by embolic implantation metastatic

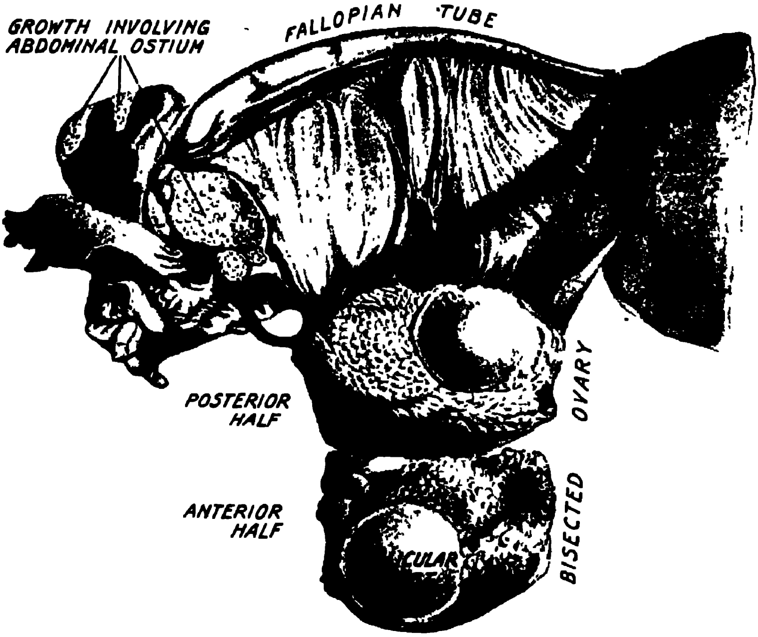

Fig. 161.—Papillary Carcinoma of the Ovary and Tube. Multipara, aged 68. The growth had spread from a malignant papilliferous ovarian cyst of the opposite side. The ovary has been bisected so as to show both surfaces, which are nearly covered with delicate papillary growth. A cluster of similar growth is seen upon the mesosalpinx and the abdominal ostium of the tube.

growths may occur in the lungs and the liver. Dissemination in the peritoneal cavity is usually accompanied by considerable accumulation of free fluid (ascites). Ascites is also occasionally seen in cases of papilliferous cysts without visible affection of the peritoneum, and in rare instances hydrothorax accompanies it.

There can be no doubt that these tumours, if innocent in their origin, may become truly malignant in the course of their development. In cases of extensive papillary dissemination, metastatic portions of the growth may become both histologically and clinically malignant. Yet if removed before this stage is reached, there is abundant clinical evidence that papillary metastases, both local and remote, which cannot be extirpated, may disappear spontaneously after removal of the primary growth. No adequate explanation of this interesting phenomenon can be advanced.

The origin of papilliferous cysts is obscure. The view widely held that they arise from Wolffian relics either in the parovarium or in the hilum of the ovary is now known to be untenable, and it appears to be probable that, like the pseudomucinous cysts, they arise from the germ epithelium. But we do not know the explanation of the extraordinary activity of their epithelium.

*Surface Papillomata.*—Sometimes masses of papillomatous growth occur upon the outer surface of an ovary in which little or no cystic change has occurred. Their general features are the same as those of papilliferous cysts, but dissemination is more rapid and their approach to malignancy is closer. There can be little doubt that these papillomata arise from the germ epithelium.

**Racemose Cysts of the Ovary.**—This form of cyst is of very rare occurrence, Jayle in 1903 having succeeded in finding only sixteen cases recorded previous to that date. It consists of an aggregation of multiple pediculated cysts, of the general shape and arrangement of a bunch of grapes, or of the vesicles of a hydatidiform mole. These cysts generally grow from, and are attached to, the surface of the ovary, but in some instances the tumour was found to be attached, not to the ovary, but to the broad ligament in its immediate neighbourhood. The individual cysts are thin walled and contain fluid varying in colour and consistence like that of cystadenomata. The epithelial lining in some of the cysts consists of high columnar cells, in others of low cubical or flattened cells. These tumours are believed to arise from the germinal epithelium of the ovary, those attached to the broad ligament being held to arise in outlying fragments of ovarian tissue.

## OVARIAN CANCER

Cancer may occur in the ovary either as a primary or as a secondary growth, under conditions which may be stated as follows :

I. As a primary growth.
II. As a malignant transformation of a previously existing ovarian tumour, cystic or solid.
III. As a secondary growth arising either by direct extension, or more often by metastasis.

**I. Primary ovarian cancer** is a comparatively rare form of tumour ; it is generally agreed that among the organs liable to be attacked by primary cancer in women the ovary stands low in order of frequency ; its occurrence is certainly very much less frequent than that of uterine cancer. Its age incidence is wide ; about 68 per cent. of cases occur in women between the ages of forty-five and fifty-five (Glendinning), i.e. in the climacteric decennium, but it may also occur in adolescents and in children. It is frequently bilateral, but a simultaneous onset of the disease in both ovaries is unlikely ; it is more probable that one ovary is attacked by metastasis or by direct extension. This view receives some support from the fact that, at the somewhat advanced period when these tumours commonly come under observation, one is usually considerably larger than the other. They are frequently, but not invariably, accompanied by ascites.

The growth is usually smooth, of irregular shape, and moderate size, but specimens weighing upwards of fifteen pounds have been described. Its consistence is usually that of a soft solid tumour, but not infrequently some parts are solid and other parts cystic (fig. 162), and the latter may form irregular protuberances on its surface. It usually has at first a well-formed fibrous tissue capsule derived from the tunica albuginea ; but this may sometimes be invaded and destroyed in places by the cancer cells, which then become free to disseminate themselves in the peritoneal cavity. On section its substance is seen to be fairly homogeneous, and of friable consistence ; numerous cystic spaces may be seen, some of which represent cavities formed by degeneration, others are lined with epithelium. Not

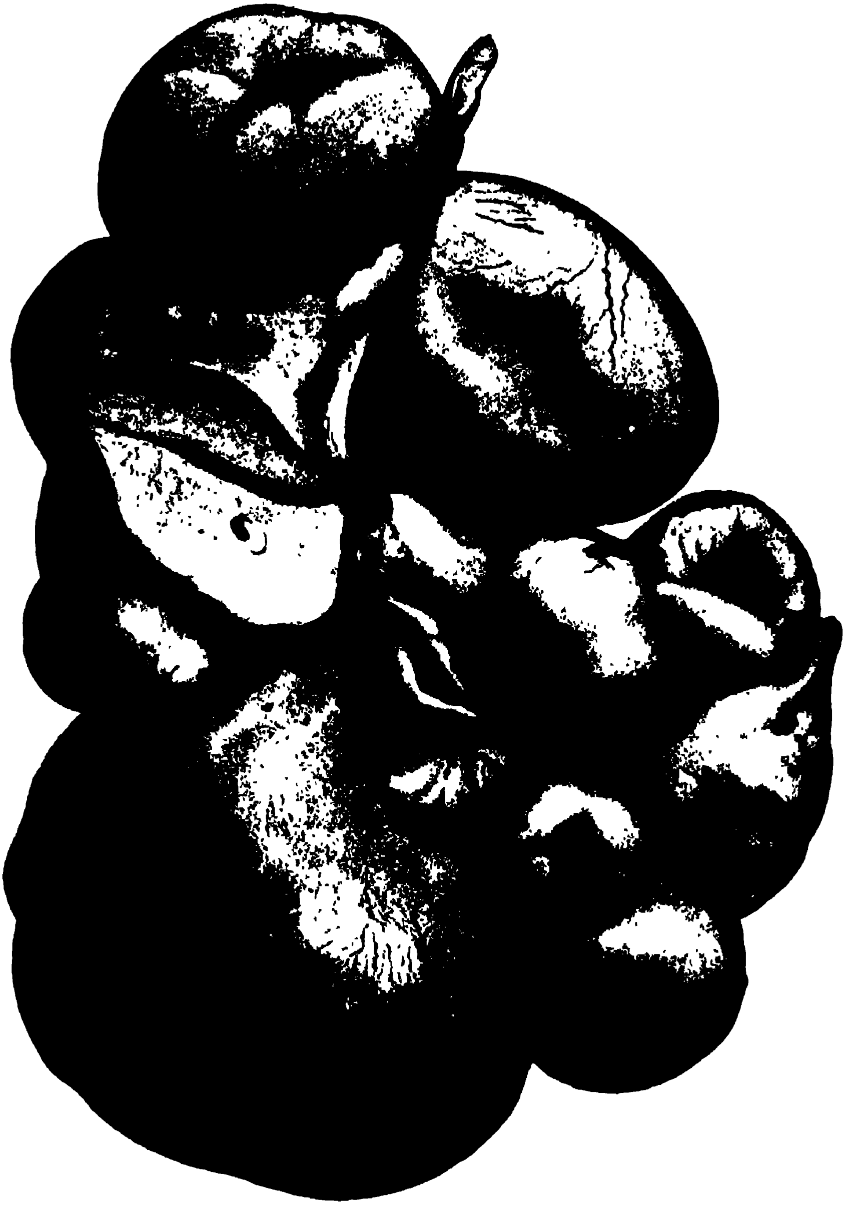

FIG. 162.—CARCINOMA OF THE OVARY (Charing Cross Hospital Museum). The large tumour is partly cystic, and partly solid; one of the solid portions has been laid open. A similar growth of somewhat smaller size was present in the other ovary. The microscopic appearances were those of the diffused form of carcinoma.

infrequently these cavities are formed in superficial parts of the tumour, forming projecting bosses which render the shape and outline of the tumour very irregular. Areas of interstitial hæmorrhage of reddish, brownish, or yellowish colour, according to their age, are also often seen. A diagnosis can only be certainly made with the microscope.

Microscopically two types can be distinguished, the *alveolar* and the *diffused* type. In the *alveolar* type the cancer cells, arranged in irregular columns or imperfectly formed tubules, are found lying in spaces of round or oval shape enclosed by trabeculae of connective tissue stroma. Sometimes the stroma is relatively very abundant, and shows œdema and advanced hyaline degeneration (fig. 163). In the *diffused* type the cancer cells are scattered indiscriminately through the stroma, not evenly, but without any attempt at limitation or confinement in spaces (fig. 164). Not infrequently both types of cancer may be found in different portions of the same specimen.

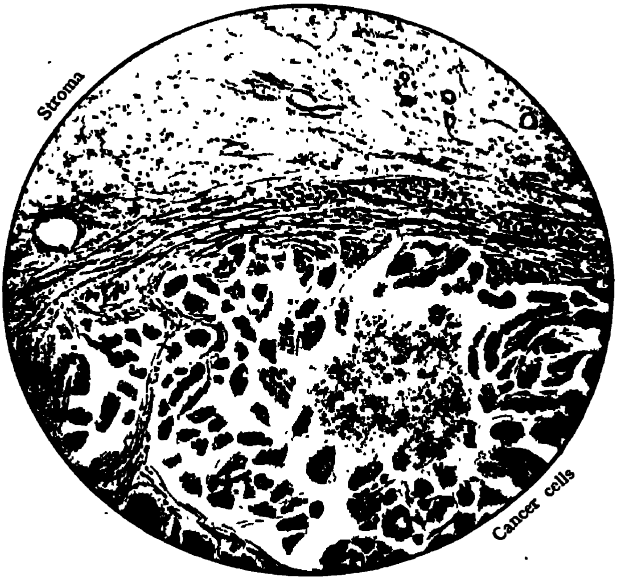

FIG. 163.—ALVEOLAR CARCINOMA OF THE OVARY. Multipara, aged 48. The cancer cells are arranged in irregular columns and masses. The stroma in the upper part of the figure is abundant and degenerated.

The cancer cells themselves possess no special features except that in some cases numerous very large cells, with globular nuclei of great size, are to be found lying among them. They resemble primordial ova, and have been regarded as derivatives of these cells by observers who have described their presence, but this view is probably erroneous.

*Dissemination of Ovarian Cancer.*—This may conceivably occur in four different ways: (1) by direct extension; (2) by lymphatic infection; (3) by peritoneal implantation of liberated cancer cells; (4) by the passage of liberated cancer cells into the Fallopian tube and uterus. *Lymphatic infection* follows much the same lines as in the case of cancer of the body of the uterus, involving, first, the broad ligament and pelvic glands, then the mesenteric and lateral groups of lumbar glands, and ultimately distant organs. *Peritoneal infection* does not occur while the fibrous capsule of the tumour remains intact; this capsule may, however, be perforated by cancerous outgrowths,

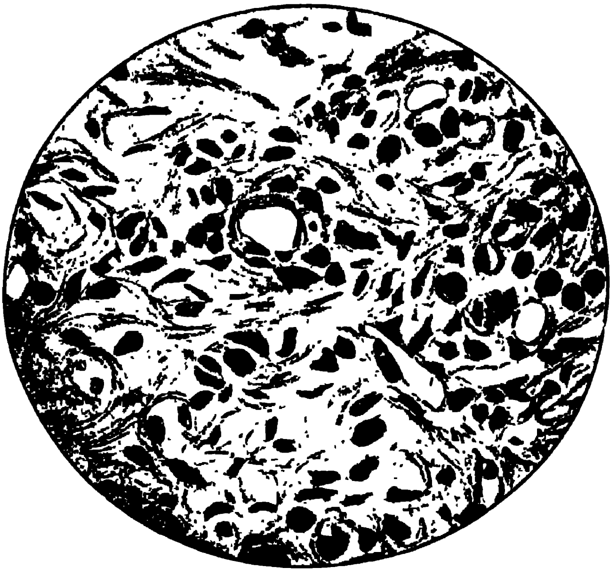

FIG. 164.—DIFFUSE CARCINOMA OF THE OVARY. Multipara, aged 30. The cancer cells are of varied shapes and sizes, and the stroma is relatively abundant.

and thus cancer cells may be set free to infect the peritoneal membrane either in the neighbourhood or, when conveyed thither by peritoneal currents, in distant parts. This form of dissemination is frequently observed in advanced cases, where large masses of nodular growth may be formed upon the peritoneum in the upper part of the abdomen. *Tubal* and *uterine* infection may also occur by cancer cells being carried by the normal peritoneal currents into the tube, and afterwards into the uterus. The occurrence in cases of ovarian cancer of small secondary nodules in the wall of the tubes has been demonstrated by Lockyer and others, and is comparatively frequent ; sometimes cancer of the endometrium occurs coincidently with ovarian cancer, and the suggestion has been made by Gebhardt that in such cases the uterus is secondarily infected from the ovary by the transit of cancer cells through the tube. The actual passage of clusters of cancer cells into the tube in such cases has been recently demonstrated by Glendinning (fig. 165),

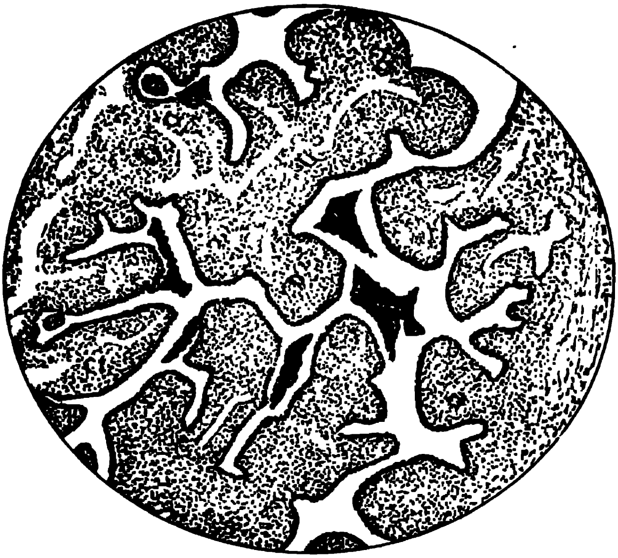

FIG. 165.—CARCINOMA OF THE FALLOPIAN TUBE, SECONDARY TO OVARIAN CARCINOMA (Glendinning). Several masses of cancer cells are seen in the tubal interstices ; they have arisen from an ovarian carcinoma, and have entered the tube through the abdominal ostium.

who has further shown that these clusters may penetrate the tubal epithelium, and grow in the subepithelial connective tissue, giving rise to secondary growths in that position. There is no doubt that this process explains the frequent occurrence of secondary nodules in the tube wall in these cases; even when none are recognisable on naked-eye examination, nodules of microscopic size may yet be present.

Post-mortem examination of women dead of primary ovarian cancer has shown that metastases are almost invariably present, the abdominal organs most frequently attacked being the following, in the order given (Glendinning): peritoneum, omentum, colon, small intestine, liver, uterus. The iliac and mesenteric glands show metastases in 50 per cent. of cases, and the lumbar glands in a somewhat less proportion.

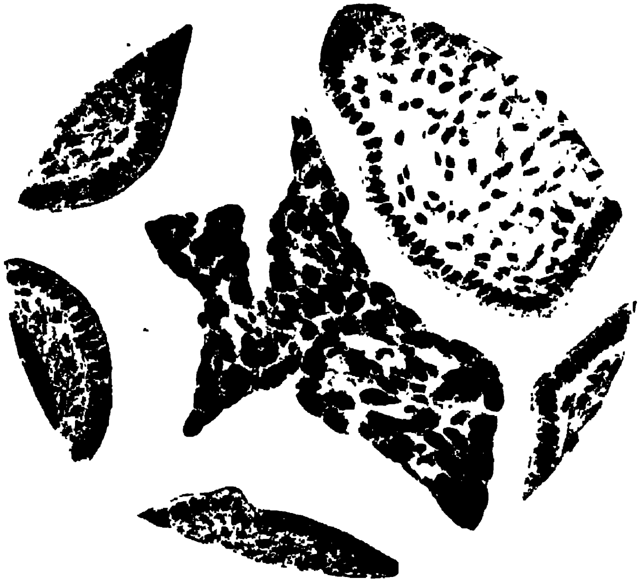

FIG. 166.—CARCINOMA OF THE FALLOPIAN TUBE (Glendinning). Showing one of the masses of cancer cells in fig. 165 under a higher power.

**II. Cancerous Metaplasia in a Benign Ovarian Tumour.**—Papillary cysts are those most frequently attacked by cancerous changes. Next in frequency come the pseudomucinous cysts, then the dermoids; corpus luteum cysts may be similarly affected. Ovarian fibromata may also become malignant, but these tumours are comparatively rare.

When a papillary cyst becomes cancerous the resulting growth is called *papillary cancer* or *adeno-carcinoma papillare*. According to Pfannenstiel one half of all ovarian papillary cysts are originally, or become later on, malignant; even if this proportion is disputed there is no doubt that the tendency of these cysts to become malignant is well marked, and has been frequently observed. Malignant papillae are much softer and more vascular than the benign ones, and on microscopic examination they show remarkably active growth, forming long compound processes, branching freely, and showing well-marked and irregular epithelial proliferation (figs. 168 and 169). They freely invade adjacent connective tissues. A frequent result of this malignant change is that the papillae grow through the cyst wall and spread out in the form of round or oval elevated patches upon

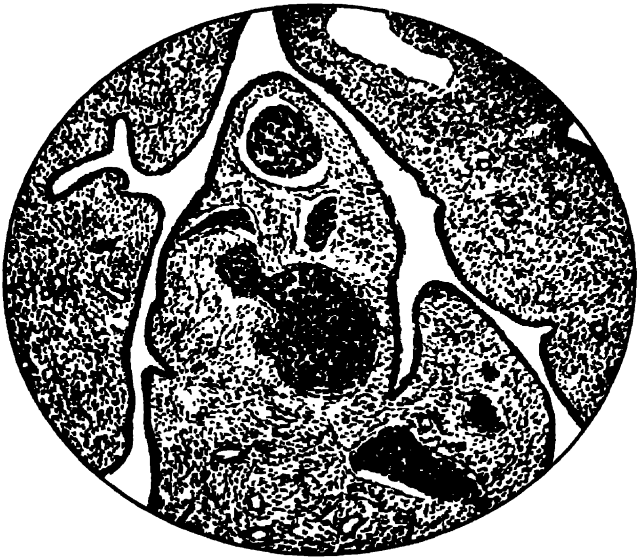

FIG. 167.—CARCINOMA OF THE FALLOPIAN TUBE (Glendinning). From the same specimens as figs. 165 and 166. In one of the plicae are seen several irregular areas of cancer cells embedded in the subepithelial connective tissue; the epithelial covering is intact. The cancer cells have pierced the epithelium at a point not seen in the section.

the outer surface. The phenomena of peritoneal implanta-

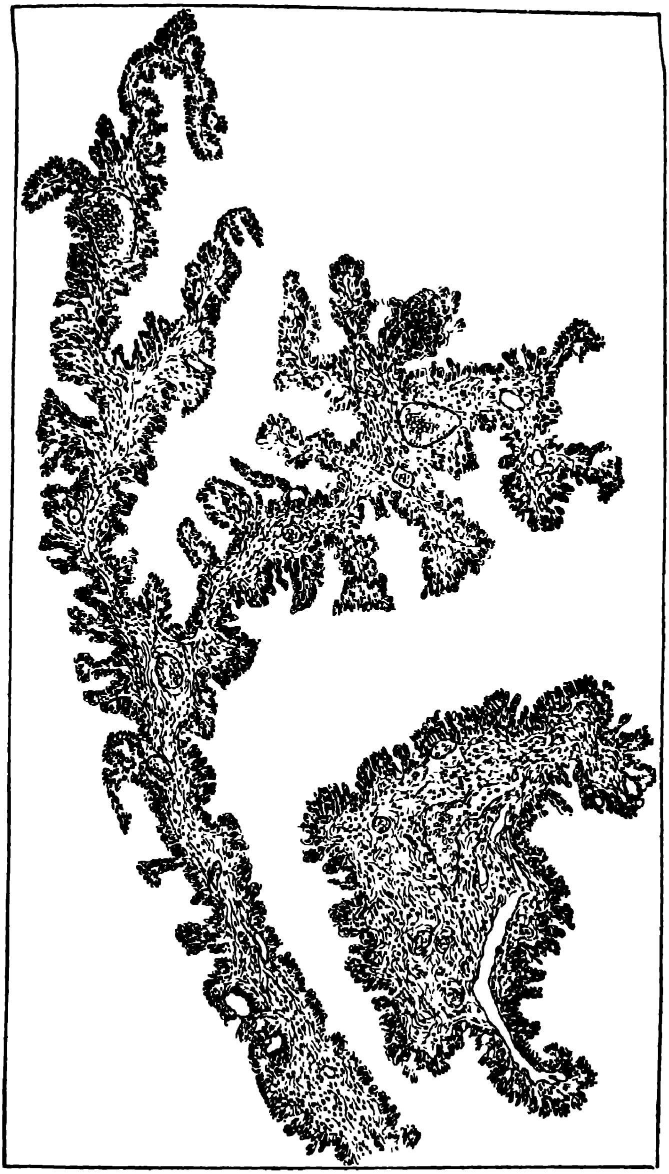

FIG. 168.—PAPILLARY CARCINOMA OF THE OVARY. The section shows a long compound papilla; the epithelial covering is actively proliferating. From the same specimen as fig. 161.

tion, either local or remote, already described (p. 341), will then follow. The tube and ovary of the opposite side frequently become involved. Ascites is usually produced at this stage, but not invariably. It will be borne in mind that somewhat similar phenomena may follow the rupture of a papilliferous cyst which is apparently benign. In the case of a malignant papilloma, disappearance of peritoneal metastases after removal of the primary growth is unlikely to occur, but cases suggesting that this is possible have been recorded.

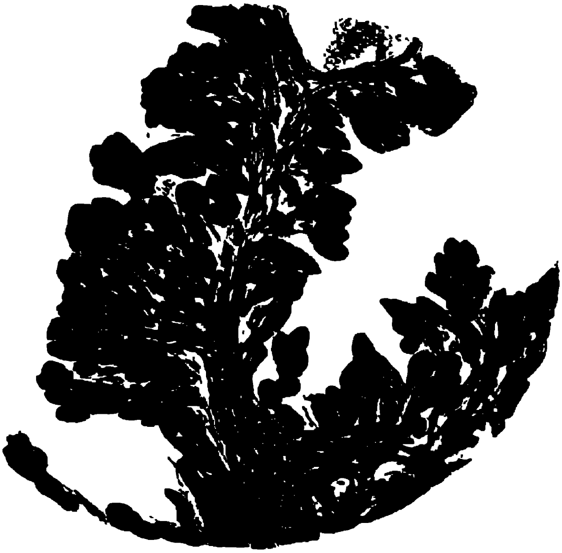

Fig. 169.—Papillary Cancer of the Ovary. The section shows a portion of a branching process or papilla; the epithelial covering shows well-marked and irregular proliferation. Portion of fig. 168, under higher power.

*Pseudomucinous* cysts become cancerous much more rarely than papillary cysts. The change is usually first manifested by the formation of a softish, solid nodule in the wall of some part of the cyst; on section this nodule is found to consist, not of a cluster of small cysts, but of a soft, yellowish tissue, which may sometimes be observed with the naked eye to invade the surrounding fibrous tissue. Microscopically it usually shows the alveolar form of adenocarcinoma. As the disease advances the compartments of the cyst may become filled up with cancerous growth,

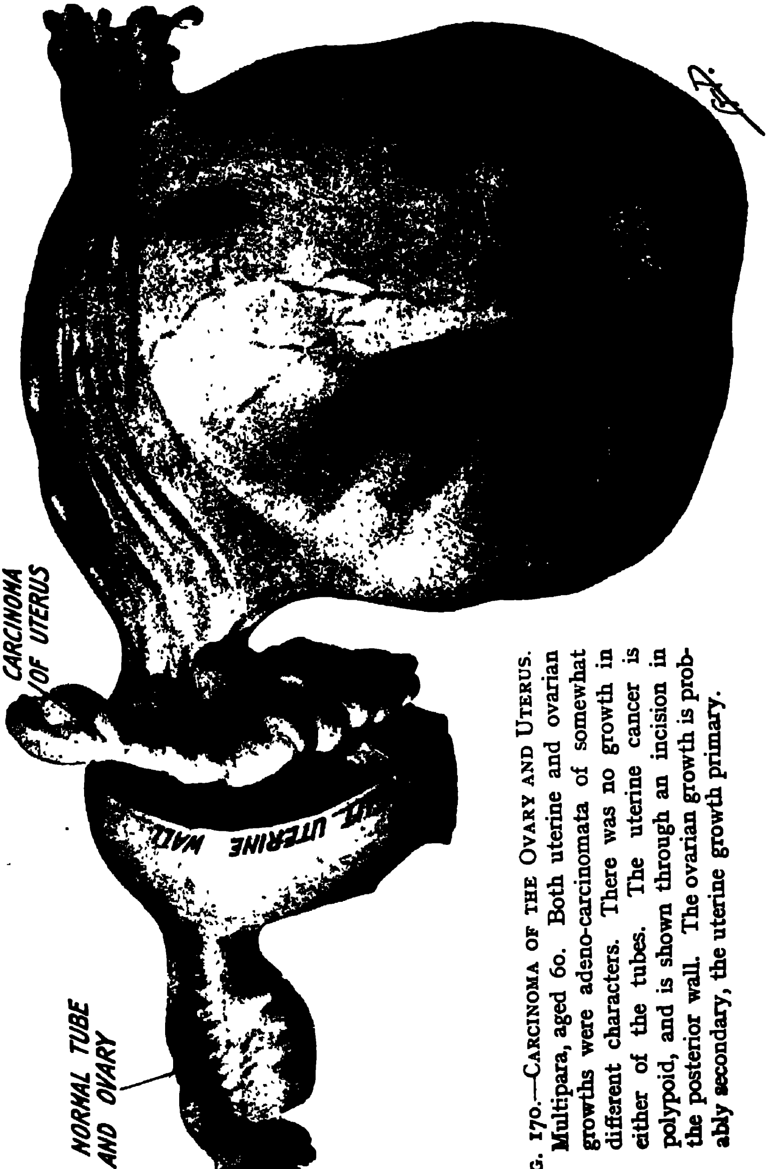

FIG. 170.—CARCINOMA OF THE OVARY AND UTERUS. Multipara, aged 60. Both uterine and ovarian growths were adeno-carcinomata of somewhat different characters. There was no growth in either of the tubes. The uterine cancer is polypoid, and is shown through an incision in the posterior wall. The ovarian growth is probably secondary, the uterine growth primary.

and an originally cystic tumour will thus ultimately be transformed into one more or less completely solid. The beginnings of this change are often unsuspected on naked-eye examination of the tumour, and are only revealed by microscopic examination of suspicious-looking areas. In advanced stages ascites is almost always met with.

When *dermoids* become affected the cancer may be either glandular or squamous-celled in type. Its occurrence is rare.

**III. Secondary Ovarian Cancer.**—When the ovary becomes cancerous secondarily the primary growth may be found (*a*) in the pylorus, the colon, or more rarely, some other part of the intestine ; (*b*) in the liver ; (*c*) in the mamma ; (*d*) in the uterine body. Not infrequently secondary growths in the ovary attain a very large size, while the primary growth in another organ remains small and gives rise to no conspicuous symptoms (fig. 170). It is the presence of the ovarian tumour, and often of the accompanying ascites, which attracts attention, not the primary disease. Both ovaries are commonly, but not invariably, affected, and usually to an unequal degree ; indeed there may be great discrepancy in the size of the two tumours. Microscopically both the alveolar and diffused types of cancer may be met with, but there is little in their histological features to distinguish secondary from primary growths. In some instances the amount of connective tissue stroma found in secondary growths is abnormally large and ill-formed, and shows an unusually strong tendency to undergo myxomatous degeneration, and to become altered by interstitial hæmorrhage.

There is great difficulty in determining the relative frequency of the three varieties of ovarian cancer just described. Cancerous changes in originally benign cysts are much commoner than was formerly supposed, as the results of systematic microscopic examination of these tumours has clearly shown. As a strictly primary disease ovarian cancer is very rare ; many instances originally regarded as primary being shown subsequently to be secondary to cancer of some other viscus. The obtrusive size of the secondary growth directs attention to it, while the primary growth being small, and giving rise to no urgent symptoms, remains unrecognised. Post-mortem statistics of cancer show that secondary growths are frequently found in the ovary after death in mammary cancer, in stomach cancer, and in cancer of the intestine. But it must be recollected that in such cases the affection of the ovary is not recognised during life unless the tumour is of large size; consequently secondary ovarian cancer as clinically met with is probably considerably underestimated. It is probable that from a clinical standpoint cancerous changes in an ovarian cyst are the most frequent, secondary cancerous tumours coming next, and the true primary growth last in order of frequency.

## CONNECTIVE TISSUE TUMOURS

**Ovarian Fibroma.**—Fibrous tumours of the ovary are comparatively rare, forming from 2 per cent. to 4 per cent. of all ovarian growths. They occur as hard solid tumours, which are frequently bilateral, and usually attain but a moderate size; a specimen weighing 65 lbs. has, however, been recorded. They occur at all periods of life, but are rarely met with before puberty; their rate of growth is, in all probability, slow. Those of moderate or large size are not uncommonly associated with ascites and sometimes, though much more rarely, with hydrothorax. The causation of these serous effusions is obscure, for growths of similar size and character when occurring in the uterus (fibroids) do not give rise to them. Nor do all ovarian fibromata produce ascitic effusion, yet its occurrence is sufficiently frequent to necessitate the conclusion that in some way it is caused by the tumour.

Ovarian fibromata may occur as (*a*) *circumscribed* or (*b*) *diffused* growths; these varieties present somewhat different characters and must be described separately.

*Circumscribed Fibromata.*—In their simplest form these growths occur as hard, white, circumscribed nodules in the ovarian stroma which are definitely encapsuled. Similar nodules sometimes appear as small pediculated growths upon the surface of the ovary. Circumscribed fibromata of considerable size may, however, be seen definitely encapsuled by an attenuated layer of ovarian substance, and showing usually at the inner pole of the tumour an area in which are found remains of active ovarian tissue. Such growths can be readily shelled out of their capsule like uterine fibroids, and their cut surface may present an appearance resembling the whorled arrangement characteristic of the last-named growths. In shape they are usually ovoid. That small circumscribed fibromata may also occur in the wall of an innocent ovarian cyst has been already mentioned.

*Diffused Fibromata.*—These are fibrous growths from the ovarian stroma which have destroyed the whole of the normal ovarian tissue. Diffused fibromata may attain considerably larger size than the circumscribed variety. They are of very hard consistence, smooth or sometimes furrowed on the surface, and of a dead white appearance on cut section. There is no capsule, and no trace remains of normal ovarian tissue.

*Structure.*—Both varieties consist of interlacing bundles of dense fibrous tissue, sometimes showing a whorled arrangement, but this is not so well marked as in the case of uterine fibroids. The nuclei are spindle-shaped, of even size and regular distribution, and not very numerous; their appearances are uniform over the whole tumour. Areas of cystic degeneration, due to coagulation necrosis, are not uncommon, and more rarely calcareous deposits are met with. In some cases it is difficult to distinguish fibroma from spindle-celled sarcoma, and this point will be again referred to in connection with the latter growth.

These tumours usually preserve the normal relations of the ovary, being pediculated, with the Fallopian tube free, and unaltered in length. Ovarian fibromata are of course innocent, and show no tendency to recurrence after removal; apparent exceptions to this rule are probably instances of sarcoma mistaken for fibroma, or of fibroma in which unrecognised malignant changes had occurred.

**Ovarian Sarcoma.**—Sarcoma is somewhat commoner in the ovary than fibroma, forming from 5 per cent. to 7 per cent. of all ovarian tumours. It occurs most frequently in youth and in advancing age, the period of middle life being comparatively exempt. At least one case has been recorded in the fœtus. In more than half the cases the growth is bilateral, and it may attain the enormous weight of 80 to 90 lbs. In over 50 per cent. of cases it is associated with serous effusion into the peritoneal cavity, and in rare cases into the pleural sac also. Sarcoma usually presents a nodular or tuberous surface (fig. 171), but is sometimes smooth and uniform in outline. In general naked-eye characters it closely resembles ovarian fibroma, but is of softer consistence, and shows a more marked tendency to degenerative

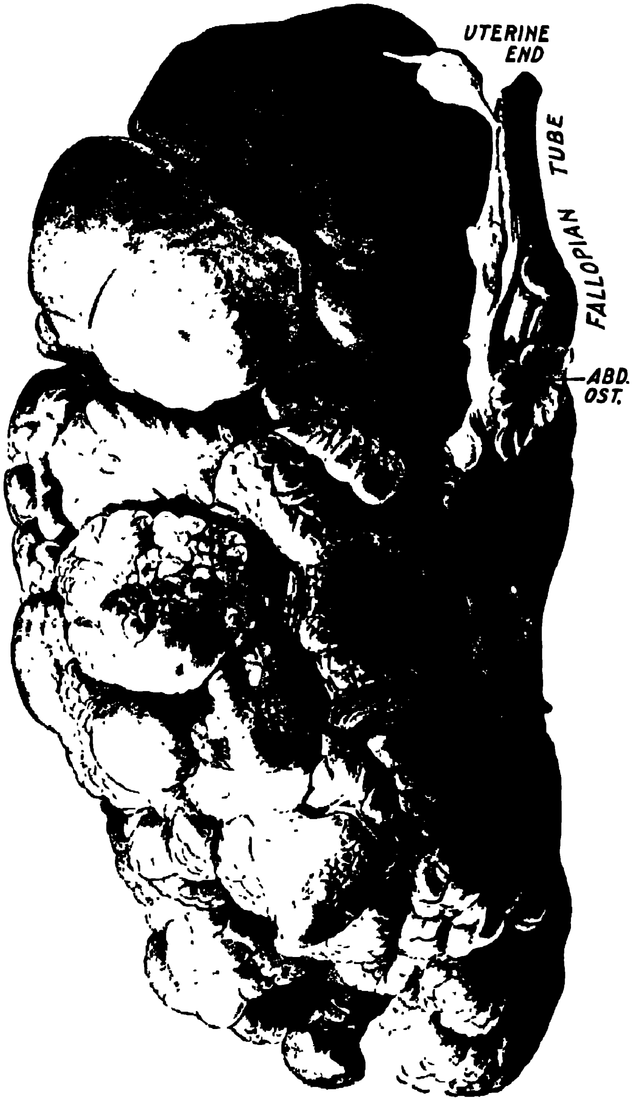

Fig. 171.—Sarcoma of the Ovary (Charing Cross Hospital Museum). Multipara, aged 43.

cystic changes and to the occurrence of interstitial hæmorrhages. No trace of normal ovarian tissue can be found.

Two varieties may be described: (*a*) the spindle-celled, (*b*) the ~~round-celled variety~~.

(*a*) *Spindle-celled Sarcoma.*—These tumours closely resemble the diffused fibromata in their general characters; they are, however, of less uniform consistence, and in general softer than the latter; they sometimes present areas of almost pulpy consistence. On microscopic examination they are seen to be more cellular than the fibromata, the softer portions consisting of aggregated masses of cells which vary a good deal in size and in the staining intensity of their nuclei. The harder portions consist of dense fibrous tissue. This variety is not highly malignant and its removal may be followed by non-recurrence.

(*b*) *Round-celled Sarcoma.*—This variety is rarer than the former; it is the form usually found when the disease occurs in childhood. It is of much softer consistence than ovarian fibroma, and is composed of masses of closely packed round and oval cells, with, in some cases, giant cells scattered among them. The nuclei vary a good deal in size and in the intensity of their staining reactions. The growth is more uniform in structure than the spindle-celled variety, but is also more prone to cystic degeneration and interstitial hæmorrhage. It is highly malignant, and rapid recurrence frequently follows the extirpation of the growth.

Metastases from ovarian sarcoma may occur locally by peritoneal implantation, or in distant organs by the passage of sarcoma cells into the vascular and lymphatic channels. Post-mortem statistics show that the most frequent seats of secondary growth are the mesentery, omentum, liver and pelvic wall (Glendinning).

*Sarcomatous changes* may also occur in the wall of an innocent ovarian cyst and in a teratoma.

**Endothelioma of the Ovary.**—These growths are closely related to the sarcomata; they can only be distinguished from them by microscopic examination, and even then only in comparatively early cases. Two varieties are described. *Perithelioma* arises from the connective tissue of the tunica adventitia of small blood- and lymph-vessels a little larger than capillaries (pre-capillaries). Around the vessels a zone of proliferating cells forms, from which processes of cells pass into the surrounding tissues; the lumen ultimately becomes occluded by compression, the

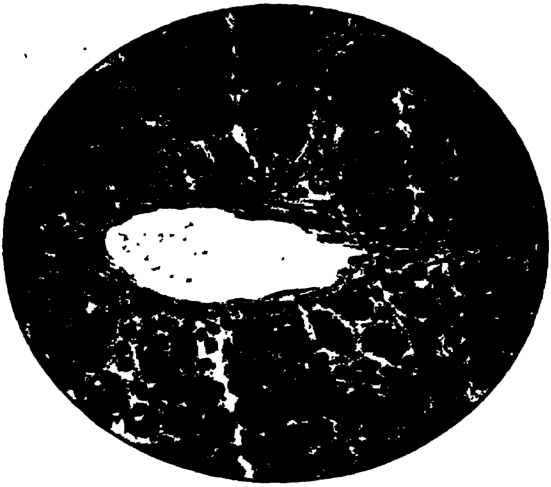

FIG. 172.—ENDOTHELIOMA OF THE PERINEUM OF A DOG (Glendinning). The cells are arranged radially around the central vessel. Two types of cells are seen: large round cells with globular nuclei: small round cells between them.

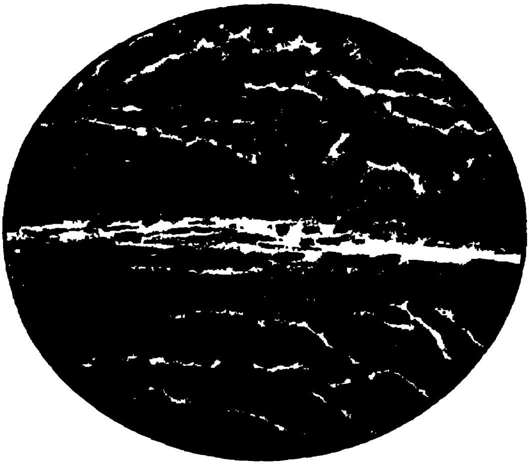

FIG. 173.—ENDOTHELIOMA OF THE PERINEUM OF A DOG (Glendinning). The section shows the arrangement of cells in parallel columns where no vessel is seen. The same two types of cells are present as in fig. 172.

endothelium remaining unaltered to the last. *Endothelioma* arises from a similar proliferation of the endothelial lining cells; these first multiply and become cubical or columnar in shape, soon they completely occlude the lumen, and being enclosed within the tunica media, the growth at this stage shows an alveolar structure. The process spreads along the endothelium of tributary vessels, and thus forms a branching system of solid processes of cells.

In the section shown in fig. 172 the relation of the new growth to the wall of the vessel is well seen. The tumour cells appear to arise from the outer coats, the endothelial lining being intact. The two cell types seen in this and in fig. 173 are probably peculiar to the animal in which the growth occurred.

In the later stages these characteristic features can be no longer made out, and the growth is indistinguishable from a round-celled sarcoma. The malignancy of these tumours is high. Clinically they present much the same age incidence as the sarcomata; they are almost always accompanied by ascites, they grow rapidly, cause pain, and show the general clinical features of malignancy (p. 388).

## OVARIAN DERMOID CYSTS AND TERATOMATA

These growths must be considered together because, though they differ widely from one another in clinical features, they are intimately related pathologically. Recent observations have modified to some extent our conception of the histology of ovarian dermoids, and have revealed more fully their resemblance to the teratomata. The essential feature of these tumours is the presence in both of a variety of heterogeneous tissues, i.e. tissues different from those of which the ovary is itself composed. In dermoids these heterogeneous tissues are for the most part of ectodermal origin, but in some cases others of mesodermal origin, and very rarely some of entodermal origin, may also be found. In teratomata the heterogeneous tissues are derived more equally from all three of the blastodermic layers; they are atypical in character, i.e. they differ from their normal prototypes, and they often undergo malignant transformation into carcinomatous or sarcomatous tissue.

**Ovarian Dermoids** are cystic growths of moderate size and usually pediculated, which never attain the same enormous volume as the cyst-adenomata. According to Olshausen they form about 4 per cent. of all ovarian tumours. They have been met with at all ages from the eighth month of intra-uterine existence (Reissman) to the eighty-third year of life (Potter). They are slow of growth, and when small give rise to no symptoms; they may, therefore, have been in existence for long periods before being clinically recognised. Olshausen found 14 per cent. of cases bilateral.

On laying open an ovarian dermoid its contents are seen to consist of a thick yellowish, pultaceous or syrupy material, which may somewhat resemble pus. In this material are often seen small solid balls of fat, and sometimes whitish balls of harder consistence which consist of agglomerations of shed epidermal cells (*epithelial balls*). Detached hairs, sometimes of considerable length, may also be found in the cyst-contents. The inner wall of the cyst is uneven and irregular, and from certain parts of it hair is seen to be growing. Sometimes balls of shed intertwined hairs are found loose in the cavity. At other parts of the wall may be seen teeth, sometimes embedded directly in the cyst wall, sometimes arising from plates of bone of irregular shape (fig. 174). At one part of the inner wall is usually to be seen a rounded projection, shaped like a nipple, or sometimes like a small mammary gland; from it hair grows, and its structure has recently received close attention from Wilms and other observers.

According to these observers this spot is the centre of origin of the growth. It represents an attempt at the formation of the cephalic extremity of an embryo, and in a favourable case the following structures, occurring in superimposed layers, may be detected: (1) cutaneous tissues representing the scalp; (2) bone representing the cranium; (3) an epidermal sulcus in which may be found teeth and bone representing the mouth; (4) neuroglia representing the brain; (5) tubes and depressions, some of which are lined by ciliated epithelium, representing the upper extremities of the respiratory and alimentary tracts. In some dermoid cysts the nipple-shaped prominences mentioned do not occur at all, so that the arrangement here described is not of universal occurrence in these tumours. The significance of these findings will be referred to again in connection with the histogenesis of ovarian dermoids.

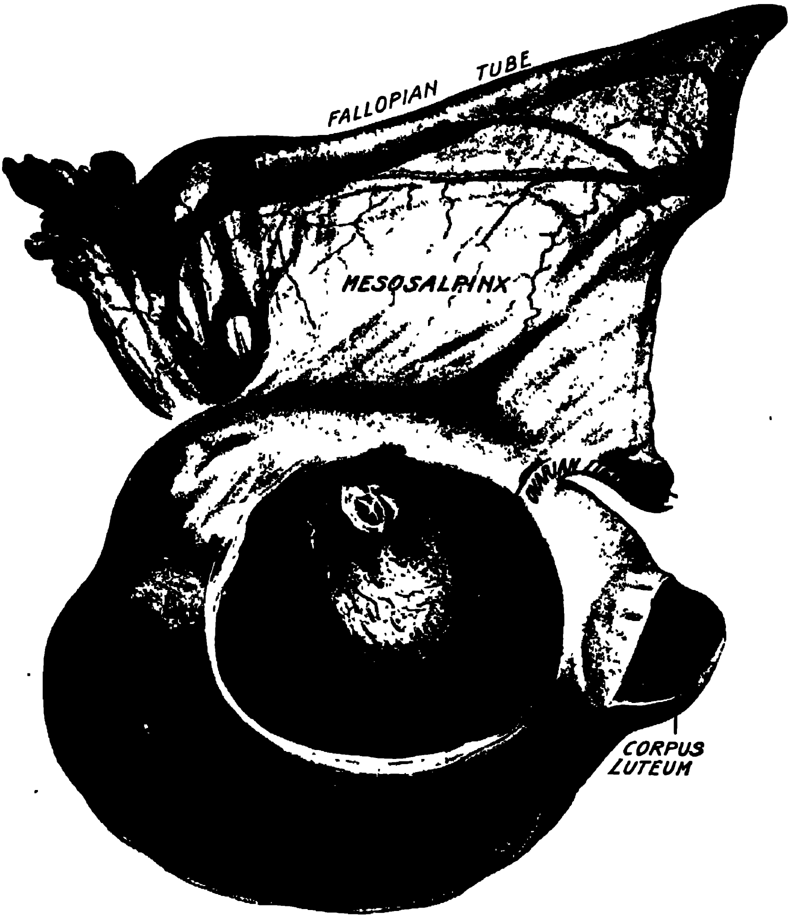

FIG. 174.—DERMOID CYST OF THE OVARY. In the interior of the cyst are seen a patch of skin furnished with hairs, and a well-formed tooth resembling a pre-molar. The whole of the ovarian tissue is not destroyed as shown by the presence of a recent corpus luteum.

It will thus be seen that a variety of tissues of ectodermal and mesodermal origin occur in these tumours, and some of them deserve more particular mention.

*Skin* only occurs in patches; it resembles its normal prototype in consisting of a cuticle resting upon a *cutis vera*, and in being furnished with hair follicles and abundant sebaceous glands (fig. 175), and occasionally with a few ill-developed, spiral sweat glands. Fatty tissue is often found beneath it, and sometimes striped muscle fibres. Imperfectly formed nails are also sometimes found.

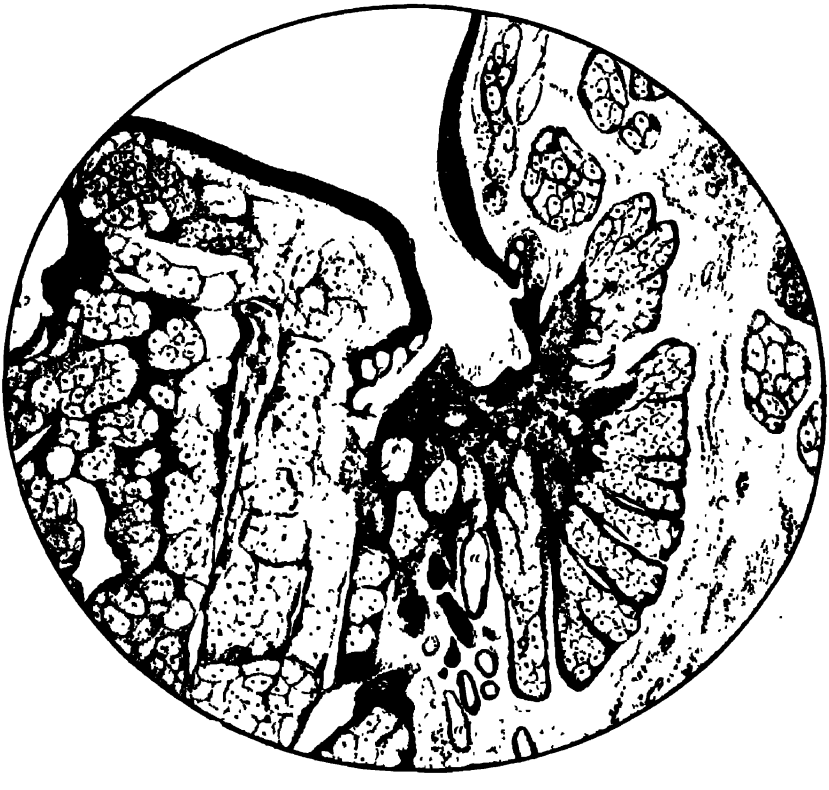

FIG. 175.—DERMOID CYST OF THE OVARY. The section shows a patch of skin with a hair follicle surrounded by abundant sebaceous glands. The tubules (*a*), (*a*) represent rudimentary sweat glands.

*Hair* in ovarian dermoids may be either dark or light in colour; individual hairs may attain the length of many inches, and sometimes they grow through the cyst wall so that their free ends appear upon the outer surface. The interesting statement is made by Bland-Sutton that as age advances hair in ovarian dermoids becomes grey, or may be shed, rendering the dermoid tumour 'bald.'

*Sebaceous glands* are active and abundant, and form the source of the characteristic fatty contents of the cyst.

*Epithelial balls* have received special attention from Bland-Sutton. They are described as about the size of pills, and are composed of masses of shed epidermal scales, aggregated around a rolled-up hair. They are not often seen, but may occur in very large numbers, so as to practically fill up the cyst cavity.

*Teeth* are found in upwards of 50 per cent. of ovarian dermoids. They are for the most part of the canine or incisor type, and consist of enamel and dentine. They may be very numerous, and as many as three hundred have been found in a single specimen. They are often partly embedded in bone, and in such cases unerupted teeth may also be found buried in the bony tissue.

*Bone* is a frequent constituent. Usually it occurs in plates and masses of quite irregular conformation. Instances have, however, been described of imitations of various normal bones of the skeleton; thus an imperfectly formed digit furnished with a nail has been seen, and bony masses resembling certain bones of the face or cranium have also been met with.

*Cartilage* of the hyaline variety in the form of flat plates is not infrequently found in dermoids.

In a few rare instances certain structures of *entodermal* origin have been found, such as patches of thyroid-gland tissue, portions of intestinal wall, consisting of plain muscle and a mucosa furnished with Lieberkühn's glands, and epithelial tubes lined with ciliated cells which have been held to represent the respiratory tract.

The structures found in ovarian dermoids may accordingly be summarised thus :

| *Ectodermal* | *Mesodermal* | *Entodermal* |
|---|---|---|
| Skin. | Bone. | Thyroid. |
| Hair. | Fatty tissue. | Mucosa of small intestine and air passages. |
| Sebaceous glands. | Fibrous tissue. | |
| Sweat glands. | Muscle. | |
| Teeth. | | |
| Nails. | | |
| Neuroglia. | | |

The inner surface of the wall of an ovarian dermoid is composed for the most part of granulation tissue, with patches of skin or mucous membrane here and there. It is probable that the granulation tissue results from the chronic irritation caused by the peculiar nature of the cyst contents.

Occasionally dermoid cysts unconnected with the ovary have been found in the abdominal or pelvic cavity. They may arise when pelvic from accessory ovarian tissue, or when abdominal from peritoneal implantation through escape of some active elements of the tumour (see p. 377).

**Ovarian Teratomata.**—These are the rarest of all ovarian tumours. As already indicated, they are clinically malignant, and tend to recur rapidly after removal. They may attain an enormous size, and in this particular they differ considerably from dermoids. Their incidence falls especially in adolescence, although a case has been reported in a woman of forty-nine. Generally speaking they form solid growths, containing more or less numerous cystic spaces, some of degenerative origin, others lined with epithelium. Microscopic examination reveals the presence of an extraordinary variety of tissues derived from all three layers of the blastoderm, and these occur in confused association without any attempt at the formation of organised structures, such as the teeth, skin and bone which are characteristic of dermoid cysts. Not infrequently the connective tissue and epithelial elements show malignant changes, giving rise to patches of sarcomatous and carcinomatous growth respectively. Metastatic deposits are of frequent occurrence, and these display the same variety of structure, e.g. sarcomatous in one case, carcinomatous in another.

**Histogenesis.**—The theory that ovarian dermoids might arise from *parthenogenesis* (asexual reproduction) is not seriously entertained by modern pathologists. Although this mode of reproduction is seen in certain plants and certain insects, there is no evidence of its occurrence in the higher animals. A later theory, enunciated by Cohnheim, ascribed the inception of tumours generally to misplaced embryonic rudiments, cells, or aggregations of cells, which became misplaced during the complicated shiftings of the embryonic tissues. In this way epidermal and mesodermal cells may have become 'included' in the ovary at an early period of embryonic development, and such cells, after lying dormant for, possibly, many years, may become active and give rise to growths consisting of epidermal and mesodermal structures. This was conveniently spoken of as the theory of 'embryonic rests.' Again, many writers have attempted to explain the occurrence of teratomata by associating them with those aberrant forms of pregnancy which result in the production of 'conjoined twins,' or with the duplication by dichotomy of different parts of the body in the fœtus.

The latest theory enunciated independently by Waldeyer and Wilms is that both dermoids and teratomata are the result of some unknown but powerful stimulus applied to the ovum cell; as a result of this stimulus proliferation occurs, and the resulting growth may contain cells representative of all the different types of structures which are normally produced from the ovum cell under the stimulus of fertilisation. The ovum cell possesses the potential power of producing all the tissues of the body; by some unknown pathological stimulus this potential power may be partially evoked, and will naturally lead to atypical and inco-ordinate results. A similar stimulus applied to an epithelial cell may produce carcinoma; to a connective tissue cell, sarcoma.

It must be borne in mind that dermoid cysts occur in other parts of the body than the ovary, and the theories of Waldeyer and Wilms, while they may account for the occurrence of ovarian dermoids, do not explain the development of the similar growths which occur in other parts of the body. It is, however, obvious that these theories satisfactorily account for both dermoid and teratomatous growths in the ovary, and duly recognise their essential similarity of structure.

**Compound Ovarian Tumours.**—The varieties of ovarian tumours hitherto described may be regarded as generally recognised types; many individual instances, however, occur of tumours which cannot conveniently be included within these types owing to some peculiarity, usually of the nature of diversity of structure in different parts. Thus cystic tumours may be in parts pseudomucinous, in other parts papillary; or, a pseudomucinous tumour may show a single dermoid loculus, or a circumscribed fibroma in its wall.

Again, an innocent cystic tumour may show malignant metaplasia of its epithelial or connective tissue elements, giving rise to a cancerous or sarcomatous change. Again, a solid tumour may be in one part fibroma, in another sarcoma (*fibro-sarcoma*); or a fibroma may show collections of epithelial tubules in some part of its mass (*fibro-adenoma*). The occurrence of plain muscle fibre in an ovarian fibroma has also been described (*fibro-myoma*); rare instances of *fibro-myo-sarcoma* have also been recorded. These compound types, though of great interest to the pathologist, possess no practical importance beyond the additional difficulty which they may introduce into the histological determination of the innocence or malignancy of individual growths.

## CYSTS OF THE PAROVARIUM

Cystic tumours arising in the parovarium proper are called *parovarian* cysts, those arising in Gartner's duct are distinguished as cysts of *Gartner's duct* or *Gartnerian* cysts. The former are by no means infrequent, but the latter are of much rarer occurrence.

**Parovarian Cysts.**—These tumours are usually of small or medium size, but occasionally attain enormous proportions. They are met with at all periods of life subsequent to puberty, but no case has been recorded at an age earlier than sixteen years. This should be considered in connection with the fact previously referred to (p. 44), that the tubules of the parovarium continue to increase in size until middle life, when they attain their maximum development. In comparison with cysts of the ovary their occurrence is relatively infrequent.

Parovarian cysts develop between the layers of the broad ligament, and maintain their intra-ligamentary situation throughout their existence. They are consequently characterised by the presence of an envelope or capsule, which consists of the peritoneum and the attenuated connective tissue of the expanded broad ligament. Small cysts invariably occupy the outer part of the mesosalpinx, the inner part remaining unaltered (fig. 176); the abdominal ostium of the tube being in contact with the tumour soon becomes expanded and its fimbriae stretched (fig. 177). At first the ovary is quite distinct from the cyst as in fig. 176; as the broad ligament becomes further expanded the ovary comes into close contact with the cyst wall, and finally becomes attenuated and stretched out over its inner or inferior aspect (fig. 177). In the early stage the cyst is pediculated in exactly the same manner as an ovarian cyst (compare fig. 153). As they increase in size they open up and expand, first the mesosalpinx, and afterwards the whole of the broad ligament, downwards to the pelvic floor, and inwards to the uterine border. The Fallopian tube accordingly becomes elongated by being stretched over the summit of the tumour, and thus may attain three to four times its usual length (fig. 177). At the same time the abdominal ostium becomes further dilated, the fimbriae being stretched out radially, and the ovarian fimbria alone sometimes extends to a length of two to three inches. Another result of its intra-ligamentary position is that it pushes the uterus over to the opposite side of the pelvis. In fairly large

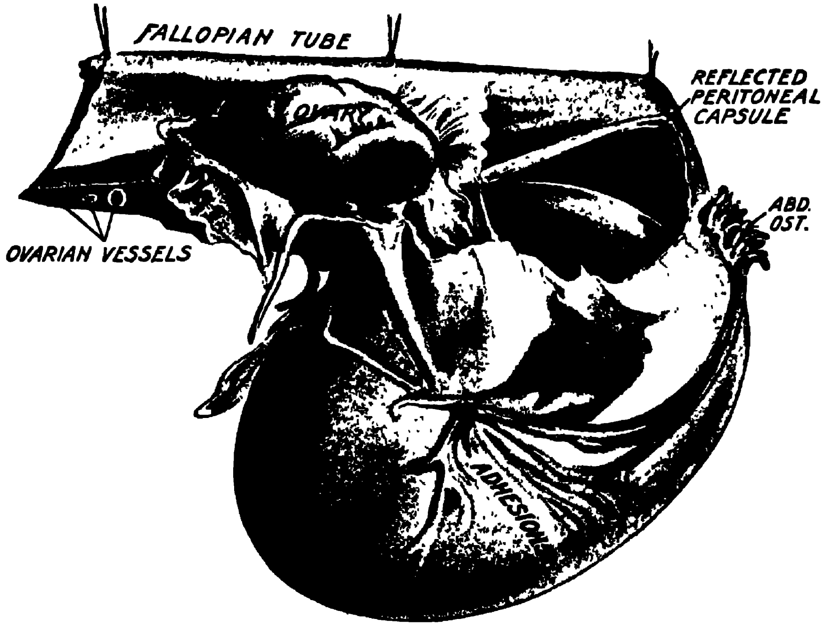

FIG. 176.—PAROVARIAN CYST. Multipara, aged 43. The cyst occupies the outer part of the broad ligament; the posterior peritoneal layer has been partly reflected to show its intra-ligamentary position.

tumours the ovary becomes closely incorporated with the wall of the cyst, while in very large specimens it is expanded so as to become indistinguishable to the naked eye; its presence can, however, usually be recognised by microscopic detection of Gräafian follicles in some part of the cyst wall.

Small or medium-sized cysts which occupy only the upper and outer part of the broad ligament may form a pedicle which is capable even of undergoing axial rotation like the true pedicle of an ovarian cyst. The largest cysts are almost invariably sessile, and sometimes a sessile parovarian cyst burrows deeply into the pelvic floor and up to the uterine border. In addition to displacing the uterus to the opposite side, it may then also disturb the relations of other pelvic organs.

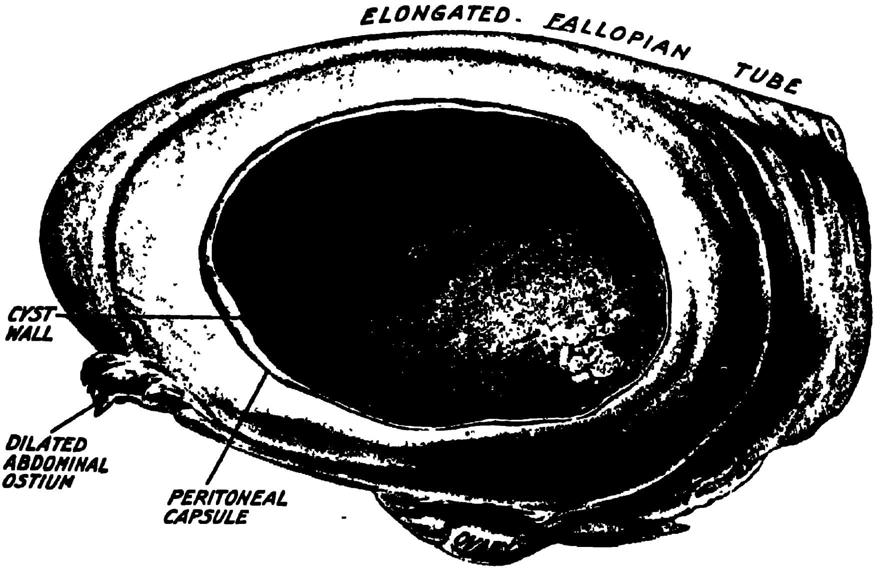

FIG. 177.—PAROVARIAN CYST (Royal College of Surgeons Museum). The Fallopian tube is stretched over the summit of the cyst which occupies the mesosalpinx. The ovary is seen on the side opposite to the tube. A cluster of papillomata is seen on the inner surface of the cyst wall.

Parovarian cysts are nearly always unilocular and their walls thin; their contents are clear and watery (sp. g. 1005–1010), containing no mucin or pseudomucin, but an albuminous substance precipitated by alcohol is usually present in small amount, and cholesterin crystals and certain salts are also found. The epithelium in small cysts consists of low cubical, ciliated cells; in larger cysts a great deal of it is lost, but traces can usually be found of flattened epithelial cells. The high palisade cells so characteristic of cyst adenomata do not occur in parovarian cysts. Papillary growths are not uncommonly found on the cyst wall (fig. 177), their structure being similar to those found in ovarian cysts.

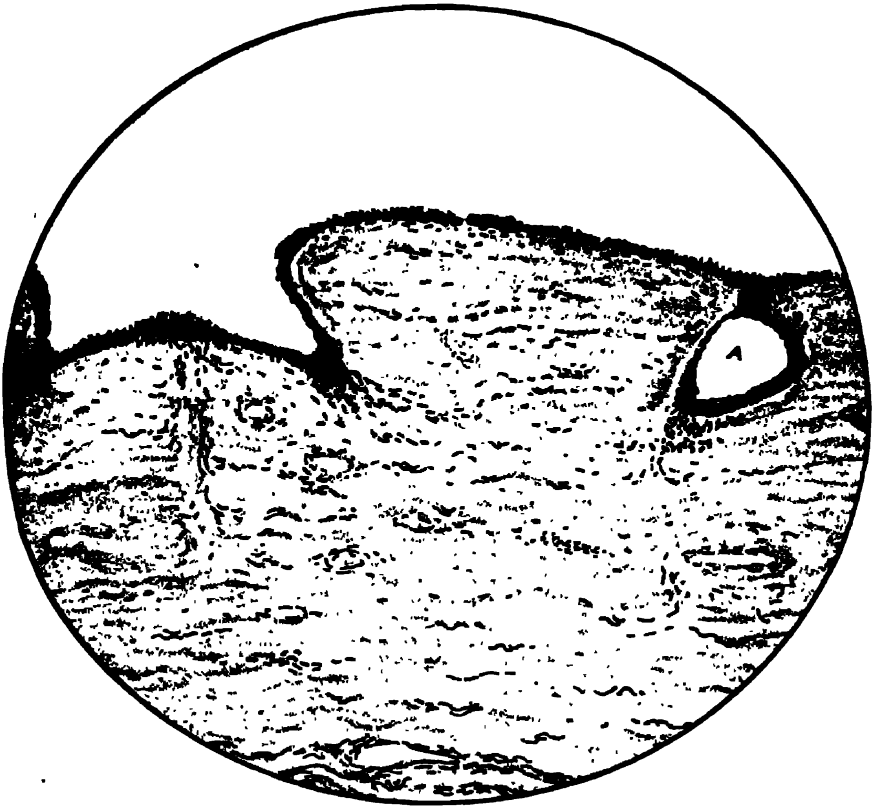

FIG. 178.—PAROVARIAN CYST. The section shows the scanty epithelial lining consisting of imperfectly preserved cubical cells. The epithelial-lined space at (*a*) probably represents a relic of a Wolffian tubule.

The points of distinction between ovarian cyst adenomata and parovarian cysts may be tabulated as follows :—

| | *Ovarian Cyst* | *Parovarian Cyst* |
|---|---|---|
| 1. | No capsule. | Capsule of peritoneum and cellular tissue. |
| 2. | Ovary entirely disappeared. | Ovary distinct or traces found in capsule. |
| 3. | Multilocular. | Unilocular. |
| 4. | Thick fluid containing mucin or pseudomucin. | Thin fluid containing neither mucin nor pseudomucin. |
| 5. | High columnar epithelium, never ciliated. | Ciliated cubical epithelium found in small cysts. |

*Cysts of Gartner's Duct.*—These growths usually occur in connection with the lower part of the duct, and thus form *vaginal cysts*, which will be considered in another place. When affecting the upper part of the duct they form cysts in the broad ligament, and like parovarians they may be papilliferous.

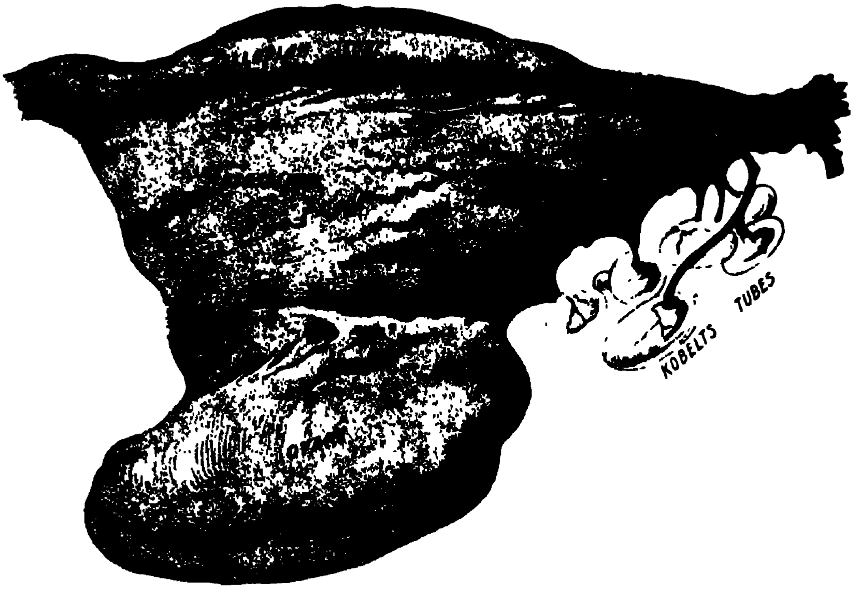

FIG. 179.—THE FALLOPIAN TUBE, OVARY, AND MESOSALPINX OF THE LEFT SIDE (Charing Cross Hospital Museum). On the free edge of the mesosalpinx are seen a cluster of small pediculated cysts, probably derived from Kobelt's tubes.

Occasionally Kobelt's tubules (see p. 44) become dilated, forming a number of small pediculated cysts attached to the free border of the mesosalpinx (fig. 179). Small cystic growths, arising from dilated lymphatics, or from a diverticulum of the Fallopian tube, or from an accessory tube, may also occur in the upper part of the broad ligament. They all are of little practical importance.

*Tubo-ovarian cysts* will be considered in connection with inflammation of the Fallopian tubes (p. 417).

## SECONDARY CHANGES IN OVARIAN TUMOURS

**1. Axial Rotation : Torsion of the Pedicle.**—This accident is found to have occurred in about 2 per cent. of cases submitted to operation. The tumours which are most likely to undergo this change are cysts of moderate size with a fairly long, thin pedicle which allows them to rise above the pelvic brim. It occurs more rarely with solid than with cystic tumours, and those of very large size are usually prevented by their bulk from rotating. The extent of the torsion varies from one half-turn to twelve complete turns ; a twist of less than one half-circle probably does not affect the circulation in the tumour at all. The effects produced upon the tumour vary with the extent of the torsion, and probably with the rapidity of its production ; these effects may be described in three stages.

(*a*) *Congestion.*—A moderate twist is sufficient to compress the thin-walled veins of the pedicle, and arrest the venous return from the tumour without greatly reducing its arterial supply. The vessels subjected to compression are the ovarian vessels which reach the tumour through the ilio-pelvic fold. The uterine artery is not affected, but since the uterine veins communicate freely with the pampiniform plexus in the broad ligament the uterine circulation is also disturbed. On the distal side of the twist it is accordingly found that the Fallopian tube, broad ligament, and cyst wall are greatly swollen (fig. 180). On the proximal side of the twist swelling also takes place, but to a less marked extent ; this is to be explained by the fact just mentioned that twisting of the broad ligament interferes to some extent with the venous outflow from the uterus itself. Both the pedicle and the tumour become engorged with venous blood, extensive interstitial hæmorrhage occurs, and in addition bleeding takes place into the loculi of the cyst. As a result enlargement of the tumour takes place, and in some cases spontaneous rupture, from increased tension due to intra-cystic effusion of blood, has been observed. Tumours in this condition are usually of a dark plum colour, and dull, having lost the polished appearance characteristic of the unaltered cyst wall. In this condition the tumour is liable to become infected from the bowel. Adhesive peritonitis is frequently found around it, causing adhesions to neighbouring intestinal coils, to the omentum and the abdominal wall; adhesions are not, however, invariably present. Extensive thrombosis is often observed in the veins of the pedicle on both sides of the twist, which may spread far into the large veins of the broad ligament.

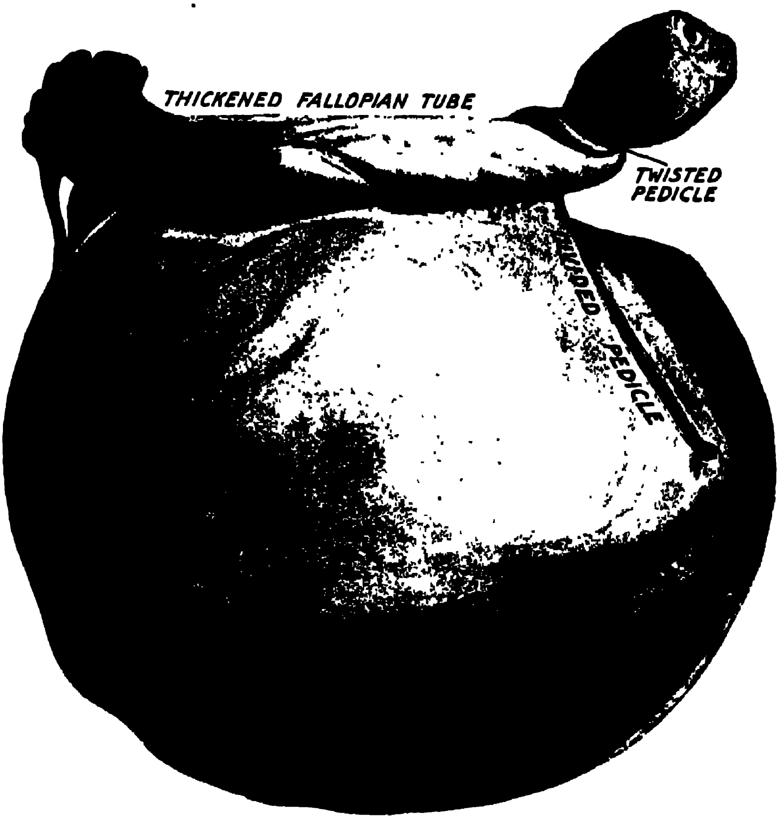

Fig. 180.—Ovarian Cyst showing Axial Rotation of the Pedicle (Charing Cross Hospital Museum).

(*b*) ~~Necrosis~~ may take place from sudden arrest of the arterial supply or, more gradually, as the result of extreme congestion. The tumour in this condition is very liable to become infected from adherent coils of intestine, giving rise to suppuration or gangrene. But even when the twist is sufficient to completely kink the arteries, necrosis may not occur if the change has been a gradual one and the tumour is small; the omental and other adhesions, which rapidly form, become vascularised and are able to furnish sufficient blood to maintain the vitality of the tumour. If the twist is too rapidly produced to allow time for adhesions to form and become vascularised, this alternative source of blood supply will not be available and necrosis will then ensue.

(*c*) *Detachment* may occur, from atrophy of the tissues of the twisted portion of the pedicle. Fresh connections having been formed during the process, the tumour not only maintains its existence but may actually increase in size and appear to be growing from some other abdominal organ.

*Causation*.—Not much is known about the causes of axial rotation. The conditions which predispose to its occurrence are small size and free mobility of the tumour, and laxity of the abdominal wall. It is therefore not uncommonly met with in pregnancy and the puerperium. Trauma or muscular strain may in some cases actually initiate the rotation, and once started the movement may, perhaps, continue spontaneously. There has been great discussion as to the *direction* of the movement of rotation. It appears that the movement may occur in either of the two possible directions, and that in the majority of cases it follows the direction of the movement of supination of the forearm on the affected side, i.e. the tumour rotates towards the side to which it belongs. An instance of axial rotation of an ovarian cyst in the fœtus has been recorded.

**2. Infection.**—Ovarian cysts are much more prone to infection than are uterine fibroids. They may become infected by the spread of septic or gonorrhœal infection from the uterus and the Fallopian tubes, or by the passage of organisms into them from the bowel through adherent coils of intestine. In pre-antiseptic times infection often followed the operation of tapping a large cyst through the abdominal parietes. Infection is, however, much commoner in the case of small pelvic cysts than in the larger abdominal ones. As already mentioned, axial rotation is a powerful predisposing cause of bowel adhesions, and consequently of infection also. It is stated that dermoid cysts are especially prone to become infected, but the evidence upon which this statement is based is inconclusive; probably, in many dermoids described as containing pus, the characteristic sebaceous contents were mistaken for purulent fluid owing to the resemblance of their naked-eye characters to pus. It is not uncommon to find certain loculi of an infected cyst containing pus, while the contents of the others are non-purulent. The infective process is clinically found to be much more often chronic than acute; not infrequently the pus is sterile at the time of operation.

A suppurating ovarian cyst becomes closely adherent to neighbouring viscera, and, after destroying the intervening walls, may discharge spontaneously by perforation into the rectum, the bladder, or the vagina. If the cyst is a dermoid, hair and teeth may thus be passed per rectum or through the urinary passages. It would seem that suppurating dermoids are more liable to perforate the bladder than other varieties of ovarian cysts, a point which is no doubt explained by their being more frequently found in the utero-vesical pouch. It is a possible, but extremely rare, occurrence for a suppurating ovarian cyst to rupture into the peritoneal cavity. When a pyosalpinx is also present a communication may be established between them, forming a tubo-ovarian abscess.

**3. Rupture.**—Three conditions may lead to rupture of an ovarian cyst: (1) traumatism; (2) sudden increase of intra-cystic tension from hæmorrhage or suppuration; (3) morbid changes in the cyst wall. Spencer Wells stated that rupture had occurred in 2·4 per cent. of his series of 1000 ovariotomies.

(1) Thin-walled cysts can sometimes be felt to rupture during a bimanual examination; this is especially liable to occur under anæsthesia with complete muscular relaxation. During labour an ovarian cyst in the pouch of Douglas may rupture from the pressure exerted upon it during the delivery of the fœtus. A large cyst may no doubt be

ruptured by direct abdominal violence such as a blow or a fall.

(2) *Axial rotation is by far the commonest cause of any considerable hæmorrhage into an ovarian cyst. The spontaneous rupture of suppurating cysts has been already mentioned.*

(3) In the colloid or jelly cysts the wall is unusually friable, and spontaneous rupture may occur from mere inability of the tissues to support the normal amount of intra-cystic tension (see p. 336).

Papillary growths, either innocent or malignant, may actually perforate the cyst wall, or by weakening it lead to spontaneous rupture. Cystic carcinomata of the ovary not infrequently undergo spontaneous perforation into the peritoneal cavity owing to the friability of the cancerous tissues.

*Results of Rupture.*—These depend entirely upon the nature of the cyst contents which are effused into the peritoneal cavity. Serous fluids of low specific gravity and scanty albuminous contents, such as those found in parovarian and follicular cysts, are readily absorbed by the peritoneum without any local inflammatory reaction taking place. No serious consequences need therefore be anticipated from such an accident as the bursting of a small cyst during clinical examination. Thick fluids containing large quantities of albuminous material, such as those found in pseudomucinous cysts, or thick fluids containing fat, loose hair, and other solid materials, such as are found in dermoids, do invariably produce a local peritonitic reaction. Small quantities of such fluids sometimes become completely encysted by adhesive peritonitis, but more commonly the fluid escapes in large amount and becomes diffused over the peritoneal cavity; it then tends to accumulate in certain positions, viz. in the pouch of Douglas and in the renal pouches, as is the case with all free fluids in the peritoneal cavity. It resists absorption, and the adhesive inflammation which is set up is a protective process which has the effect of isolating and imprisoning the foreign material. Unless the cyst contents were infected at the time, general peritonitis does not supervene.

In the case of dermoids and papillary cysts a further result ensues, viz. the active epithelial elements which these tumours contain become engrafted upon the peritoneal membrane and grow there. Thus a crop of peritoneal warts may be found after rupture of a papillary cyst, not only in the neighbourhood of the tumour but also in distant parts. Cases have been described in which, after rupture of a dermoid cyst, numbers of small epithelial growths with hairs have formed upon the peritoneal membrane. It is probable also that some instances of non-ovarian abdominal dermoids have been formed by peritoneal implantation from ruptured ovarian dermoids (see p. 365). The rupture of a malignant ovarian cyst is followed by rapid spread of the growth to the surrounding peritoneum. It is now well established that in non-malignant cases of peritoneal implantation spontaneous disappearance of the peritoneal growths occurs after removal of the primary tumour.

**4. Adhesions.**—Plastic peritonitis may occur around an ovarian tumour in consequence of axial rotation or infection, as has been already mentioned. Many tumours become adherent, however, in which these changes have not occurred. Small growths lying in the pouch of Douglas are more often found to be adherent than larger ones occupying the abdominal cavity. Coincident disease, such as appendicitis, salpingitis or pelvic peritonitis from uterine infection, is the usual explanation of the formation of the adhesions. In some instances the unaltered tumour may itself cause sufficient peritoneal irritation to produce the same result without the aid of bacterial infection; dermoids are believed to be especially liable to form adhesions in this way. On the other hand, solid tumours such as fibromata become adherent more rarely than cystic tumours, though the amount of peritoneal irritation which they cause must be greater.

Adhesions result in more or less complete fixation of the tumour; when thus confined in the pouch of Douglas it is often spoken of as 'incarcerated.' Adherent pelvic tumours cause pain and usually menorrhagia; and there can be no doubt that the formation of adhesions increases the urgency of the symptoms to which these tumours give rise. Operative difficulties may also arise from adhesion of coils of intestine to the growth.

**5. Malignant Degeneration.**—The occurrence of carcinomatous or sarcomatous changes in the wall of an innocent ovarian cyst has been described in another place (p. 349).

**6. Degeneration Cysts in Solid Tumours.**—Cystic cavities are frequently met with in the interior of both innocent and malignant solid tumours. They result from myxomatous degeneration or coagulation necrosis; their walls are ragged and irregular, their fluids contain altered blood and tissue débris, and they possess no epithelial lining. It will be recollected that similar cysts are frequently found in fibroid tumours of the uterus (p. 253).

## CLINICAL FEATURES OF OVARIAN TUMOURS

It has been already mentioned that it is impracticable to attempt to follow a pathological classification in considering ovarian tumours from the clinical point of view, inasmuch as exact pathological diagnosis by clinical methods is at present impossible. Careful consideration of each case will, however, usually admit of its being allotted to one of three classes, viz.: (a) *Benign cystic tumours*; (b) *Benign solid tumours*; (c) *Malignant tumours*. The clinical features will therefore be considered in relation to each of these three classes in turn.

The age incidence of ovarian tumours generally is very wide; they may occur in the fœtus, or they may first be recognised in extreme old age. Operations for their removal have been undertaken with comparative frequency in children under twelve years of age, and in a few cases infants under two years of age have been surgically relieved of these growths. Sir John Williams showed from a study of statistics, now twenty-five years old, that ovarian tumours occurred with decidedly greater relative frequency in unmarried than in married women.

**Benign Cystic Tumours.**—Uncomplicated, innocent ovarian cysts produce few symptoms, those met with being mainly due to their *size*, their *position*, or to *secondary changes* which have occurred in them. Their presence does not necessarily affect either of the ovarian functions of menstruation or ovulation, as, even when they are bilateral, a certain amount of active ovarian tissue persists. They do not as a rule cause pain, nor do they affect the general health until they have reached a large size. An ovarian cyst may accordingly attain a large size before the patient's attention is attracted to it, and then it is only the abdominal enlargement of which she complains.

The *position* occupied by the tumour is, however, an important factor in the case. Small tumours not exceeding the size of a cricket-ball are usually found in the pouch of Douglas, into which they sink by gravity. When exceeding this size they generally rise above the pelvic brim into the abdominal cavity, where they ride free among the viscera. If the ascent of such a tumour is prevented by absence of a pedicle, or by any other cause, pain usually supervenes, being due in part to crowding of the pelvic viscera proper, in part to disturbance of the pelvic circulation, and sometimes to direct pressure upon the nerves which pass out through the sacro-sciatic and obturator foramina. It is very uncommon for ovarian cystic tumours in the pelvis to cause retention of urine from pressure on the urethra or the neck of the bladder, but frequency of micturition is commonly observed in such cases. The rectal functions are not disturbed, but menstruation may become more painful and profuse than usual, probably as a result of obstruction to the venous return from the uterus by pressure on the bases of the broad ligaments. The only secondary change likely to occur in small ovarian cysts detained in the pouch of Douglas is inflammation; this is sometimes due to infection from the large bowel, with which it is in close contact, or from the uterus, and sometimes simply to irritation or injury of the peritoneal surface on which the tumour lies. As a result, adhesions will form, i.e. plastic peritonitis will occur in the neighbourhood of the tumour. The tumour may then become a source of pain, aggravated by menstruation, by exertion, jolting, coitus, and constipation.

Ovarian cysts which have risen into the *abdominal cavity* proper give rise to far less trouble than those detained in the pelvis. They do not cause pressure symptoms until they are large enough to fill the greater part of the abdomen and stretch the abdominal walls; in extreme cases they may, however, displace the diaphragm upwards and embarrass the action of the heart, and the respiratory movements, and also obstruct the circulation through the great abdominal veins, thus leading to hæmorrhoids, and to œdema of the lower extremities. Even in the case of the largest cysts the amount of œdema is not extreme, owing to the development of a collateral circulation by way of the veins of the abdominal parietes (fig. 181). In cases such as these the general health may become profoundly deteriorated; emaciation may be extreme, resembling that found in the late stages of cancer, and clinical observers of fifty years ago were accustomed to describe an 'ovarian facies' in such cases—a peculiar sallow tint of the skin, with an expression of weariness and suffering. Owing to the popularisation of the operation for removal of ovarian tumours, cases are now very rarely allowed to reach this advanced stage before surgical relief is obtained.

The rate of growth of an innocent ovarian cyst is usually slow, and at times it may remain stationary for long periods. Rapid increase in size is usually due to axial rotation, to hæmorrhage, to infection, or to malignant changes.

*Physical Signs.*—When *pelvic* in position an ovarian cyst is inaccessible from the abdomen, but is recognised on bimanual examination as an oval or globular, tense, elastic swelling lying as a rule behind the uterus, which it displaces forwards. When uncomplicated, it is movable and not sensitive to touch. Its position is rarely exactly median, but it does not necessarily lie upon the side from which it grows. The pedicle may be palpated bimanually when the local conditions are favourable; this is made easier by anæsthesia, or by pulling down the cervix with a vulsellum to put the pedicle on the stretch. Non-adherent cysts are movable independently of the uterus; adherent cysts are not, and care is then required in distinguishing them from uterine fibroids. The posterior surface of the cyst can be felt best from the rectum. Usually cysts of this size are regular in contour and uniform in consistence. Rounded tense projections due to the presence of daughter cysts on the surface may, however, be found; sometimes a densely hard area may be felt at some part of the surface, suggesting that the tumour is a dermoid containing a bony or cartilaginous plate in its wall.

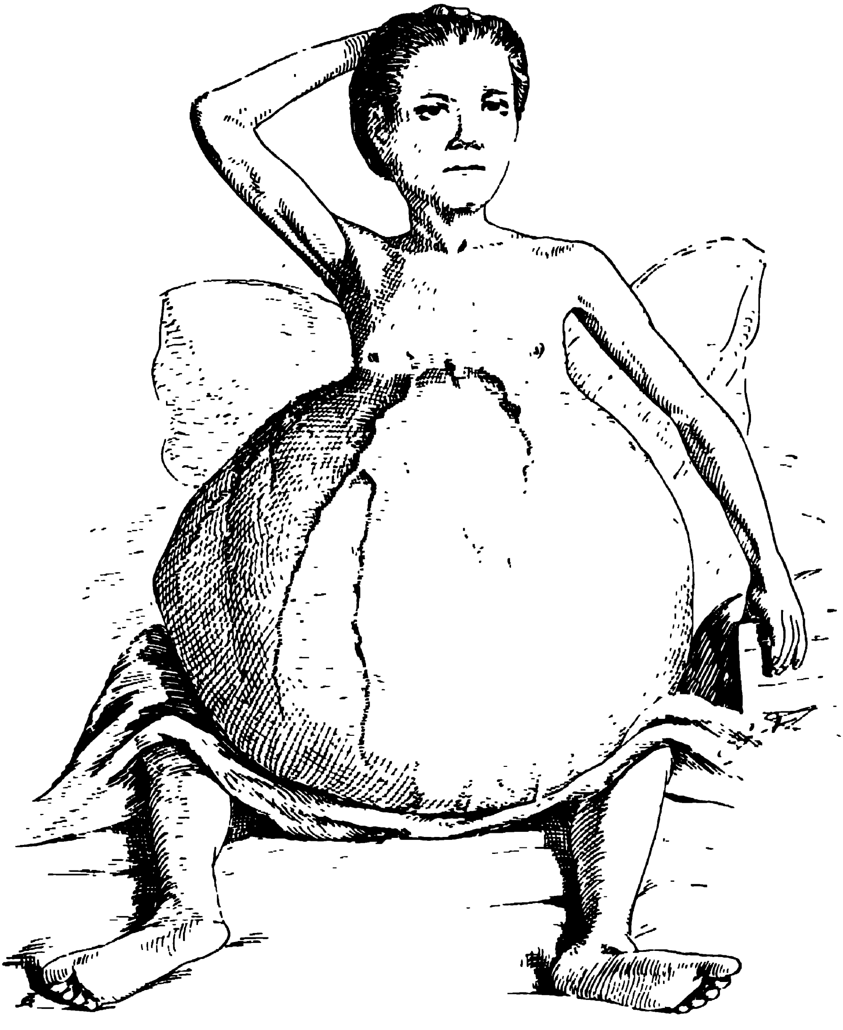

FIG. 181.—LARGE OVARIAN CYST IN A COLOURED WOMAN AGED 47 (Hammond). The tumour contained 10¼ gallons of fluid. Dilated subcutaneous veins are seen coursing over the abdomen. There is only slight œdema of the lower extremities.

Small ovarian cysts are occasionally found in the utero-vesical pouch instead of in the pouch of Douglas, in which case the uterus becomes partially or entirely retroverted. It is a curious and interesting point that an unusually large proportion of the tumours found in this situation are dermoids.

A *medium-sized cyst,* when *abdominal* in position or when extending from the pelvis into the abdomen, forms a well-defined, elastic swelling, with a surface generally smooth, but sometimes broken by rounded projections representing external clusters of daughter cysts. It usually lies more to one side than the other, but it may be exactly mesial in position. It is freely movable and insensitive to touch ; when the pedicle is long the fingers can be passed below the tumour into the pelvic brim ; usually, however, the tumour can be felt to pass deeply into the pelvis, the lower border being inaccessible. On percussion it is dull, except near the borders where intestine usually overlaps it, giving a subresonant note. Tumours large enough to extend above the umbilicus may yield a fluid thrill, but this is not always the case ; the production of a thrill depends, as has been explained, upon the presence of a large cavity in the anterior part of the tumour ; if no such large cavity is formed, a definite thrill cannot be obtained. Ovarian tumours are all dumb on auscultation. Bimanual examination will show that the uterus is distinct from the tumour ; its position may be normal, but frequently it lies retroverted.

The flanks will usually be found resonant in uncomplicated cases, but when present, free fluid in the peritoneal cavity is significant, and the exclusion of ascitic fluid should always receive attention in examining a case of ovarian tumour. It must be recollected that free fluid may occur with papillary or dermoid cysts, or any malignant tumour, or may result from rupture of a pseudo-mucinous cyst.

*Very large cysts* which greatly distend the abdominal cavity are comparatively rare ; they may, however, attain a size such as that shown in fig. 181, where the tumour appears to be considerably larger than the patient's body. The entire abdominal wall including the flanks is then protuberant, the two sides being usually unequal ; the belly is pendulous, the umbilicus is everted, the skin tense, and the subcutaneous veins may become distended.

A fluid thrill will be readily obtained in all directions; the greater part of the abdomen is quite dull to percussion, the exceptions being the subcostal angle, where stomach resonance persists, and the outlying portions of the flanks, where a muffled colon note can nearly always be obtained. When the patient lies on her side the upper flank may become slightly more resonant owing to sinking of the heavy tumour towards the dependent flank. The peri-umbilical area is always completely dull. On vaginal examination the uterus is usually found either retroverted or prolapsed; it is very rare to find its position normal in the case of very large tumours. In these cases it is often very difficult to locate the body of the uterus except by introducing the sound, but this matter is not of great practical importance.

The diagnosis of the *side* from which the tumour arises is also a matter of small importance; three points serve as guides, viz. the lateral inclination of the tumour (which, however, is sometimes misleading), the position of the pedicle, and the palpation of a normal ovary upon the unaffected side, which, however, is rarely practicable without anæsthesia.

**Differential Diagnosis of a Benign Ovarian Cyst.**—(1) Small *pelvic cysts*, when freely movable, may be confused on physical examination with a pediculated subperitoneal *fibroid* or with one of the rare instances of a non-adherent *hydrosalpinx*. Careful examination should, in the case of the fibroid, demonstrate the immediate attachment of the tumour to the uterus, its hard, well-defined edges, and its solid consistence. It is very rare, although possible, for a subperitoneal fibroid to possess a pedicle long enough to be clinically recognised. Softening is very rarely met with in small fibroid tumours, except in pregnancy, so that the difference in consistence is a point of great practical importance. As fibroids are usually multiple, and as interstitial or submucous growths usually accompany subperitoneal ones, the uterine cavity may be found enlarged when measured by the sound, and menorrhagia may be a prominent symptom. A hydrosalpinx can often be distinguished from an ovarian cyst by its elongated or tortuous shape (fig. 193). It must be recollected that rectal examination is of great value in the detailed examination of swellings occupying the pouch of Douglas.

A small ovarian cyst, when inflamed and adherent in the pouch of Douglas, may be difficult to differentiate from an effusion in the pouch, or from a swelling formed by inflammation of the tubes and ovaries; but the differential diagnosis of these conditions must be postponed until their general features have been considered (p. 423).

(2) *Medium-sized ovarian* cysts in the abdomen offer the easiest of diagnostic problems when the local conditions are favourable for examination, for the fluid consistence of the tumour, and the independence of the uterus, can be readily recognised. Obesity greatly increases the difficulties of diagnosis, since it obscures the results of percussion and the consistence and mobility of the tumour.

If amenorrhoea from some intercurrent cause is present, the differential diagnosis from *pregnancy* may present difficulties. The chief reliance will then be placed upon the condition of the mammae and the cervix, and the results of auscultation. Total absence of breast changes and of cervical softening in connection with an abdominal tumour exceeding the height of the umbilicus, will serve to exclude pregnancy with practical certainty. The fœtal heart sounds, if recognised, offer the most certain diagnostic sign of pregnancy. If any doubt exists, a second observation after a fortnight's interval will demonstrate the increase in size of the gravid uterus at the usual rate—about one inch in fourteen days.

On the other hand, the presence of menorrhagia from an intercurrent cause may suggest that the tumour is a *fibroid*. As a rule, the dense solid consistence and sharply defined margins of a fibroid tumour are easily distinguished from the elastic resistance and less sharply defined outlines of an ovarian cyst. Felt through a very thick abdominal wall a soft fibroid and a tense ovarian cyst may, however, be difficult to distinguish from one another by palpation, and the fibroid bruit may be inaudible; it is, however, rare for the mobility of fibroids to be so free as that of uncomplicated ovarian tumours. Chief reliance must, however, be placed in such cases upon recognising, by the bimanual examination, that the uterus is independent of the tumour in the case of the ovarian cyst. Difficulty may arise in the case of fibroids which have been softened by extensive degenerative changes, for their consistence may approximate to that of an ovarian or other cyst. But even fibro-cystic tumours of the uterus seldom have walls thin enough to allow a fluid thrill to be felt, and the detection of the thrill in a doubtful case is decidedly in favour of the ovarian origin of the tumour. Elongation of the uterine cavity, as measured by the sound, usually accompanies a fibroid tumour, but ovarian tumours have no tendency to enlarge the uterus. Considerable elongation of the uterine cavity, e.g. a measurement of 3½ to 4 inches or more, is hardly ever met with except in pregnancy and fibroid tumours, and is therefore an important diagnostic point; but no inference can be drawn from slight elongation. Additional difficulties may arise from the co-existence of ovarian and fibroid tumours. When one or other tumour is of predominant size the smaller is obscured and is often overlooked; the most important point is the want of uniformity in the consistence and character of the whole tumour, when carefully examined in detail. This should always suggest the possibility of the double nature of the condition.

Certain general considerations may assist the differential diagnosis of fibroid and ovarian tumours. Fibroids are of slower growth, and accordingly present a long clinical history of menorrhagia, and possibly of other symptoms, before they attain large size. Ovarian tumours are of more rapid growth, the clinical history is relatively short, and menorrhagia is quite an unusual result of their formation.

Many other forms of cystic tumours may occur in the abdomen, although much more rarely than cysts of the ovary; the more important are *mesenteric* cysts, *pancreatic* cysts, *renal* cysts including hydronephrosis, *distension* of the *gall-bladder*, *encysted peritonitic accumulations*, and *hydatid* cysts. Like ovarian cysts these tumours are slow of growth and do not give rise to pain, as a rule, until they attain considerable size.

4- *Mesenteric* and *pancreatic* cysts arise in the umbilical or subcostal zones of the abdomen (see fig. 51); when they have attained a large size they may extend downwards to the pelvic brim. They are often freely movable, but usually it is possible to make out that their point of attachment is in the abdomen, not in the pelvis. An ovarian cyst with a long pedicle, although it may be found in the umbilical zone, can be pushed down into the pelvis, unless it has become adherent in its altered position. Mesenteric and pancreatic cysts, even when freely movable, are tethered in the abdomen proper. On percussion, irregularly distributed areas of subresonance are found over these tumours, owing to a loop of intestine crossing them.

*Renal* cystic tumours, when of small size, may be found in the pouch of Douglas having been completely dislocated from their normal position, or possibly congenitally misplaced. When of large size they may extend from the costal margin to the pelvis, and though definitely lateral in position, they may extend across the middle line to the opposite side. Usually large renal tumours pass deeply into the flank, and can be felt posteriorly between the last two ribs and the iliac crest ; this is quite unusual in the case of an ovarian cyst. The renal tumour is oval in shape, the long axis being usually oblique, and a band of partial resonance, corresponding to the colon, can usually be made out on its anterior surface. The affected kidney may be functionally inactive, secreting no urine, a point which can be determined by cystocopic examination of the bladder or catheterisation of the ureters.

Occasionally a healthy kidney or the healthy spleen may occupy the pouch of Douglas ; the nature of such cases can seldom be cleared up except by opening the abdomen.

*Encysted collections of peritonitic* fluid are usually tuberculous in origin. Signs of tubercle in other organs may be present, suggesting that the abdominal condition is also of that nature. The other organs may, however, be free from disease, but irregular fever, wasting, and night sweats may accompany the abdominal enlargement, when tubercle will naturally be thought of. In some cases, however, the abdominal enlargement is almost the only symptom present ; amenorrhœa, however, occurs much more frequently than with ovarian cysts.

The abdominal swelling is usually situated in the umbilical and hypogastric zones. It is ill-defined and only slightly movable, and is not entirely dull on percussion.

These points are explained by the fact that the enclosing wall is composed of adherent viscera, of which a considerable part always consists of intestine. If it extends into the pouch of Douglas, the lower pole is ill-defined; the body of the uterus has no independent mobility, being involved in the surrounding adhesions.

*Hydatid* cysts may occur in the ovary or the Fallopian tube or in any part of the subperitoneal tissue of the pelvis. In the latter position they form fixed, diffused swellings which may attain large size and extend into the abdomen. Their nature may sometimes be surmised from a history of the previous occurrence of hydatids in the same subject; or they may discharge spontaneously through the bladder or bowel, when daughter cysts and hooklets will be discoverable in the discharges. Otherwise diagnosis is practically impossible before operation.

(3) *Very large abdominal* cysts must be distinguished from extreme degrees of *ascites*, whether simple or associated with intra-abdominal malignant disease, and from *fibro-cystic tumours* of the *uterus*. With the patient lying on her back, in ascites the clearest note on percussion is obtained around the umbilicus, the dullest note in the flanks; in ovarian cysts the converse is the case. In cases of ascites the distribution of dulness shifts readily with changes of posture, but this is not so with ovarian cysts, except to a very slight extent. In ascites some causal condition, such as cirrhosis of the liver, may be detected, or the presence of hard nodular masses in the abdomen may suggest advanced malignant disease with secondary deposits. It is very uncommon for fibro-cystic tumours of the uterus to attain the enormous size of the largest ovarian cysts, and if it has been determined that the fluid is encysted and not free, the probability that it is ovarian is very high. Nevertheless instances have been recorded (Webster) in which a tumour of this character revealed itself as a fibro-cystic uterine tumour on opening the abdomen. The differential diagnosis is not of great practical importance, as the treatment in either case is to remove the tumour.

**Benign Solid Tumours.**—Like cysts, the innocent solid tumours of the ovary seldom give rise to direct symptoms until secondary changes occur in them. There is a somewhat greater tendency for bilateral fibromata to cause amenorrhœa by complete destruction of the ovarian substance than is the case with the cysts. They attract attention, from the inconvenience caused by their bulk and weight, earlier than the cysts, and the amount of abdominal distension produced is frequently aggravated by the occurrence of ascites. Axial rotation occurs, but with less relative frequency than in the case of cysts.

On examination these tumours form oval, firm, insensitive swellings which have the same relations to the uterus as the cysts. Their dense consistence and sharply defined outlines are usually appreciable without difficulty, except in obese women. But generally speaking these tumours are not so hard as fibroids of the uterus, and in some cases, from the occurrence in them of cystic degeneration, they may feel elastic or doughy on palpation. Free ascitic fluid can be detected clinically in a considerable proportion—probably one-third to one-half—of all cases ; in considerably more than this, fluid is found on operation in quantity too small for clinical recognition. The clinical results of axial rotation and infection are much the same as in the case of cysts.

A solitary, pediculated, subperitoneal, fibroid tumour may be difficult to distinguish from an ovarian fibroma. If, however, the uterus is movable independently of the tumour, the latter is in all probability ovarian, and if the presence of ascitic fluid can also be made out, it becomes practically certain that the tumour is ovarian. Menorrhagia is not induced directly by either growth, but since fibroids are often multiple, an interstitial growth may be present along with the subperitoneal one, when the periods may be profuse. An ovarian fibroma may induce amenorrhœa when bilateral, but has no tendency to increase the menstrual flow. It is, however, quite possible in subjects of an ovarian fibroma also to find fibroid tumours in the uterus, when no assistance can be obtained in diagnosis from analysis of the symptoms. In the case of the fibroid tumour it may be possible, with the assistance of general anæsthesia, to recognise that both the ovaries are present and distinct from the tumour, when its ovarian origin can be definitely excluded.

**Malignant Ovarian Tumours.**—Ovarian tumours are more frequently discovered to be malignant after removal than recognised as such clinically. In the early stages malignant disease gives rise to no characteristic symptoms or clinical appearances; a tumour which on naked-eye examination, after removal, appears to be innocent may, however, be clearly demonstrated by the microscope to be malignant. Accordingly primary ovarian cancer is not recognised as such, as a rule, until the growth attains a large size or until intra-abdominal metastases are formed. A solid ovarian tumour, associated with ascites and giving rise to considerable pain, may justly be suspected of being malignant, but from what has been said with regard to pain and ascites on a previous page, it will be seen that these points are by no means characteristic of malignant disease. Ascites occurs in only about 50 per cent. of cases of ovarian cancer (Glendinning), and probably somewhat less frequently than this in sarcoma. In women over forty years of age the significance of these points as indications of malignancy is greatly increased. Amenorrhœa is often, but not always, present, and indicates, in the early stages, that the disease is bilateral. Tumours of large size are, however, not infrequently accompanied by irregular bleeding from the uterus.

In cases of secondary ovarian cancer, and in the advanced stages of the primary disease, great and rapidly increasing abdominal enlargement is met with due in part to ascites, in part to the size of the ovarian growth, and in part to the formation of numerous visceral metastases. Pain, which is comparatively early in its appearance, grows severe as the enlargement of the abdomen becomes pronounced. Later still, general wasting, and swelling of the feet occur, which appear the more striking as they are associated with great abdominal enlargement. These features are, however, common to the advanced stages of other forms of intra-abdominal malignant disease, and are not specially characteristic of ovarian cancer.

It must be recollected that in cases of secondary ovarian cancer the tumour often greatly exceeds the primary growth in size, and may be met with at a time when few, if any, indications of the existence of the primary growth are to be found. Particular attention should therefore be paid, in cases of suspected malignant ovarian tumours, to the discovery of any symptoms which might indicate the presence of a primary growth in the stomach or intestine, or in the mamma.

Solid malignant tumours may arise, in the omentum, the mesentery, or the pelvic cellular tissue, which closely resemble those of ovarian origin; all are usually secondary, not primary. Owing to their anatomical relations these growths rapidly infiltrate surrounding structures, and therefore tend to become fixed when comparatively small; ovarian malignant growths, as has been explained, are at first encapsuled, and only when the capsule has been broken through do they infiltrate locally; they therefore retain their mobility much longer than those of the mesentery or the omentum.

**The Diagnosis of Secondary Changes in Ovarian Tumours.** When an ovarian tumour becomes troublesome by increasing rapidly in size, or by giving rise to pain, or when it first reveals its presence by the sudden onset of acute abdominal symptoms, it is certain that some secondary change has set in or that the growth is malignant. The clinical features of the secondary changes are therefore of great interest and importance.

**Axial Rotation.**—The clinical results of axial rotation depend in the main upon the rapidity with which rotation occurs, and its extent. Rotation not exceeding one-half of a circle, found upon operation, has often been unsuspected clinically, and probably gives rise to no symptoms. When exceeding half a circle, severe symptoms are not in all cases produced, but the tumour may increase rapidly in size and become sensitive to touch, and may give rise to pain. These symptoms in the case of a presumptively innocent cyst always suggest axial rotation. It is probable that only an extensive twist rapidly produced gives rise to acute abdominal symptoms. Sometimes these are sudden in onset, the patient being unexpectedly seized with severe abdominal pain and vomiting; more often the onset is gradual and the symptoms consist of increasing abdominal pain, with distension and tenderness, and usually a moderate amount of fever. The acute symptoms may last for several days, during which the abdominal distension increases, mainly owing to the progressive increase in size of the tumour which is caused by the rotation (see p. 372). In the majority of cases the acute symptoms subside spontaneously, but, as has already been pointed out, very serious results, such as rupture or gangrene of the cyst, may ensue.

The *diagnosis* in acute cases is made by discovering the tumour; owing to the distension and tenderness this may be difficult, and even when a tumour has been known to exist and can be felt, detailed examination is impracticable. But the association of an abdominal or pelvic tumour with the symptoms just described is of itself almost a sufficient warrant for the diagnosis of axial rotation; rotation of a fibroid tumour may also produce acute symptoms of a similar nature, but this accident is very much more frequent with ovarian than with uterine tumours. It will be recollected, also, that ovarian tumours are especially prone to this accident during pregnancy or the puerperium.

*Treatment.*—Ovarian tumours which have become twisted should be removed without unnecessary delay. It is not, however, necessary to operate during the stage of acute pain and fever, for these symptoms almost invariably subside spontaneously and the operation can then be performed with less risk to the patient. If the symptoms do not subside in two or three days, further delay is, however, inadvisable.

**Inflammation and Infection.**—Ovarian tumours which become inflamed are usually of small size, and are confined in the pelvic cavity; the two chief sources of infection being the bowel and the uterus. The formation of adhesions around such tumours necessarily follows. They then invariably give rise to pain aggravated by exertion, by jolting, and sometimes by coitus. The adhesions may be gradually produced without any acute attack of pain or illness; sometimes, however, the onset is acute, the patient being confined to bed for a few days, and thereafter complaining more or less constantly of pain. The clinical features accordingly closely resemble those of a case of inflammation of the uterine adnexa (see p. 423). On examination, tumours thus affected are sensitive, unusually tense, and their mobility is more or less completely lost.

When small cysts of this kind undergo *suppuration*, a dense inflammatory deposit is thrown out around them, which results in absolute fixation of the swelling, and obscures its outlines and characters. There is no means of distinguishing, in such cases, a pyosalpinx from a small, suppurating ovarian cyst. Large cysts are comparatively rarely the seat of suppuration. Well-marked constitutional disturbance, with rise of temperature, results from suppuration when the infective process is acute; this is, however, relatively rare, the infective process being much more often chronic. In cases of the latter class, the tumour is usually so effectually isolated by plastic peritonitis that absorption from it is more or less completely prevented, and constitutional symptoms are accordingly slight in extent or entirely absent. The pus from such tumours may prove to be sterile on bacteriological examination.

As felt through the abdominal or vaginal wall the swelling is densely hard and quite fixed ; its cystic nature may be by no means evident. It is then difficult to differentiate it from other forms of *pelvic abscess,* and this point will be again referred to on p. 431.

**Ovarian Tumours and Pregnancy.**—The association of pregnancy with a single ovarian cyst of moderate size is so frequently observed, that the conclusion may be drawn that the presence of such a tumour offers little hindrance to conception. Bilateral tumours form a more serious obstacle to pregnancy, and are therefore seldom observed with it. Solid ovarian tumours being of much rarer occurrence than cysts, are much less frequently met with in pregnancy, but the presence even of a malignant ovarian tumour does not necessarily prevent the occurrence of conception.

Ovarian tumours do not unfavourably affect the course of pregnancy or tend to induce abortion. When of small size their presence may be completely overlooked until labour is over, and even in the puerperium they may not be detected unless some secondary change such as axial rotation occurs in them. When lodged in the pelvis they cause pressure symptoms during the later months of gestation, and this leads to their discovery ; but not uncommonly it is the obstruction offered by such tumours to delivery which first reveals their presence.

When a large ovarian cyst lying in the abdomen is associated with a gravid uterus of similar size the diagnostic problem is often somewhat difficult of solution. The swelling is much larger than is appropriate to the period of amenorrhœa ; usually the uterus and the tumour lie side by side, and the presence of an oblique sulcus or depression indicates that the swelling consists of two parts ; in one half of the swelling the signs of pregnancy appropriate to the period of gestation will be found, in the other half these will be absent. When one is much larger than the other, the smaller usually escapes recognition, and the case is regarded as a simple instance of pregnancy or of ovarian cyst. Great difficulty will be often experienced in distinguishing an ovarian cyst from a subperitoneal fibroid under these circumstances, as the latter may become so much softened during pregnancy as closely to resemble the former in consistence (see p. 263).

Pregnancy does not affect the rate of growth of ovarian tumours, but definitely increases the risk of occurrence of certain secondary changes in them. Thus axial rotation is found to have occurred in about 6 per cent. of ovarian tumours removed during pregnancy (Sir John Williams), as compared with a general incidence of 2 per cent.; the risk of rupture is even more considerably increased, the percentage occurrence, according to the same observer, being about 10 per cent., the greater number of which occurred during or after labour. In the puerperium there is also the increased risk of suppuration from spread of infection from the uterus.

## TREATMENT OF OVARIAN TUMOURS

Treatment is entirely surgical. No means are known by which the growth of these tumours can be in any way influenced, nor does age in any way affect them, as is the case sometimes with uterine fibroids. Inasmuch as exact diagnosis of the pathological nature of the tumour is impossible, there should be no delay in their removal. Tumours which give rise to no clinical suspicion of malignancy may prove to be malignant on microscopic examination. Their liability to become twisted or infected supplies a further reason for their prompt removal. Ovariotomy is one of the most successful of abdominal operations, and may be undertaken with confidence even in childhood or in advanced age; the co-existence of pregnancy scarcely, if at all, affects the prognosis of recovery from the operation. The tapping of any large ovarian cyst is not advisable, owing to the risk of infecting the contents. This procedure may, however, be desirable in cases of extreme cardiac embarrassment, as a means of temporary relief to the circulation, and should be followed as soon as may be by removal of the tumour.

Small non-adherent cystic tumours may be removed by colpotomy (p. 599), but the abdominal operation is to be advised in all cases of large tumours, or of those believed to be extensively adherent or suspected of being malignant.

# PART VII

## MORBID CONDITIONS OF THE FALLOPIAN TUBES

Congenital Abnormalities
New Growths
Inflammatory Affections
Tubal Pregnancy

## MORBID CONDITIONS OF THE FALLOPIAN TUBES

Inflammatory affections of the tube are considered in the next section dealing with Pelvic Inflammation, and the results of pregnancy in the tube in the section on Extra-uterine Gestation. The remaining pathological conditions are rare in their incidence, and are of importance chiefly from the point of view of pathology.

**Congenital Abnormalities.**—Apart from the alterations necessarily associated with some forms of double uterus (see p. 523), congenital deformities are rare.

An *accessory abdominal ostium,* situated on the outer part of the ampullary portion of the tube, and usually on the dorsal surface, sometimes occurs. It is furnished with a ring of fimbriae, and is usually smaller than the normal ostium. *Diverticula* of the lumen, passing into the muscular wall and lined with columnar epithelium, are not uncommon, and may in some cases explain the detention of a fertilised ovum in the tube. *Accessory* tubes also sometimes occur; these are diverticula from the lumen furnished with an abdominal ostium and lined with a plicated mucous membrane.

**Tubal Cysts.**—Small sessile cysts, varying in size from that of a millet seed to that of a pea, are not uncommonly found beneath the peritoneal coat of the tube. Some of these are *dilated lymphatic* spaces; others, however, are lined with cubical epithelium, and are formed, according to Kossman, from outlying relics of the Müllerian duct, according to von Recklinghausen from relics of the Wolffian body. These cysts are often multiple. As they increase in size they may become pediculated, and may then attain the size of a walnut. The small pediculated cyst usually found attached to the edge of the ilio-pelvic fold and called the Hydatid of Morgagni is a structure of precisely similar character and origin. From occlusion of both ends of an accessory tube an *accessory hydrosalpinx* (Handley) may be formed; it occurs as a small pediculated cyst attached to the surface of the tube near its outer end, and its true nature is indicated by the plicated character of its lining membrane.

Sänger has described a *cystic myxo-fibroma* of the tube, and cysts of *echinococcal* origin (hydatids) have been described by Doléris and by the author. In the case of the former the lumen of the tube was dilated and packed with daughter cysts; in the case of the latter the hydatids had been deposited and had developed in the subperitoneal cellular tissue, the lumen of the tube remaining unaffected (fig. 182).

**Tumours of the Fallopian Tubes.**—The following forms of tumour may occur in the tube: *fibroid, lipoma, enchondroma, sarcoma, dermoid, papilloma, carcinoma, chorionepithelioma.* Only papilloma and carcinoma are of clinical importance.

*Papilloma* may occur as a surface growth, or as a growth from the mucous membrane. The former is only met with as an extension from papillomatous growths of the ovary. The latter is an independent but very rare disease; masses of the characteristic cauliflower excrescences are formed, which expand the tube so as to form a swelling clinically recognisable as an enlarged tube. Opinions are divided as to whether the growth is originally inflammatory in origin, occurring as a complication of chronic salpingitis, or whether it is adenomatous. That it may be innocent is rendered highly probable by the fact that, in a case recorded by Doran, the patient was quite well thirteen years after the extirpation of the tube. In other cases recurrence has occurred after removal, and it is probable that the original growth was really malignant. In its close relation to malignancy, papilloma of the tube resembles the same disease in the ovary (p. 341).

*Carcinoma.*—Cancer in the Fallopian tube may be primary or secondary.

In its *secondary* form the disease may be due to direct extension by continuity of tissues from cancer of the ovary, or of the body of the uterus. In ovarian cancer it has

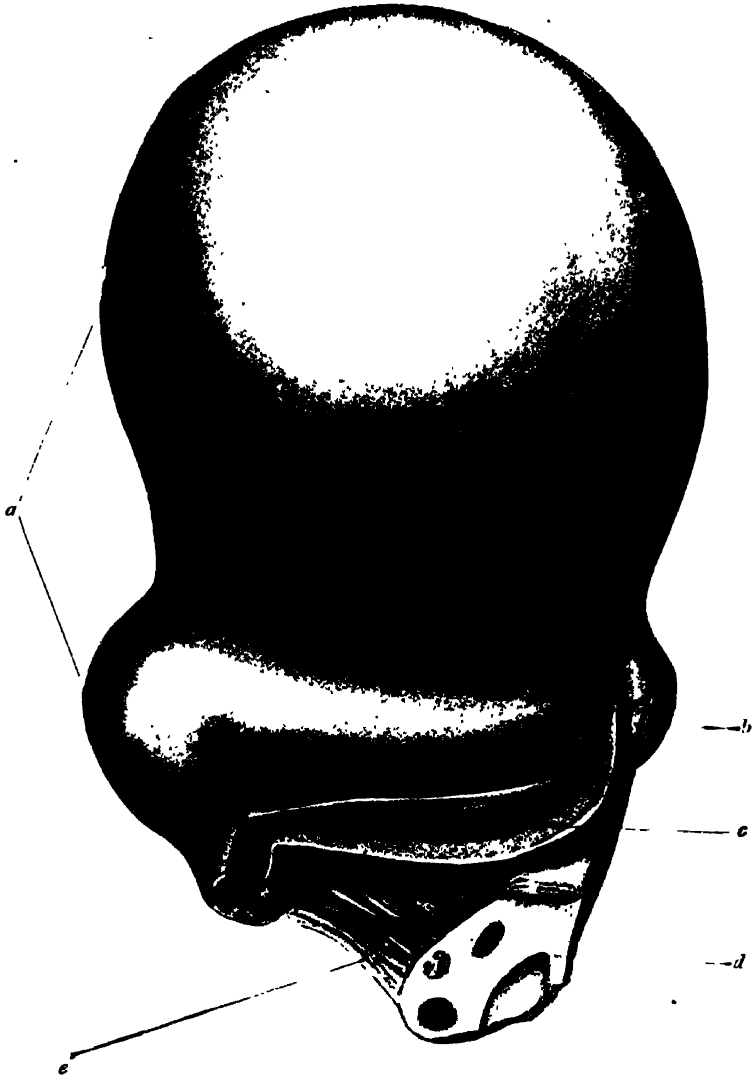

FIG. 182.—HYDATID (ECHINOCOCCAL) CYST OF THE FALLOPIAN TUBE. *a*, Cyst. *b*, Closed abdominal ostium. *c*, Lumen of tube laid open. *d*, Ovary. *e*, Mesosalpinx. The cyst has formed in the subperitoneal cellular tissue of the upper wall of the tube.

already been mentioned that the tube is frequently found to be involved, small microscopic deposits being present even when no naked-eye changes can be observed. And it was also pointed out that in such cases cancer cells which have escaped from the ovarian growth may be carried into the lumen of the tube, may penetrate the epithelium and give rise to nodules of carcinoma in the subepithelial tissues (see fig. 165). When primary cancer occurs in abdominal viscera other than the ovary and the uterus, the tube appears to be but seldom secondarily affected; Glendinning has, however, recorded two instances in which the primary growth was in the stomach. It is probable that many presumptively primary cases are in reality secondary to an undiscovered cancer in some other organ.

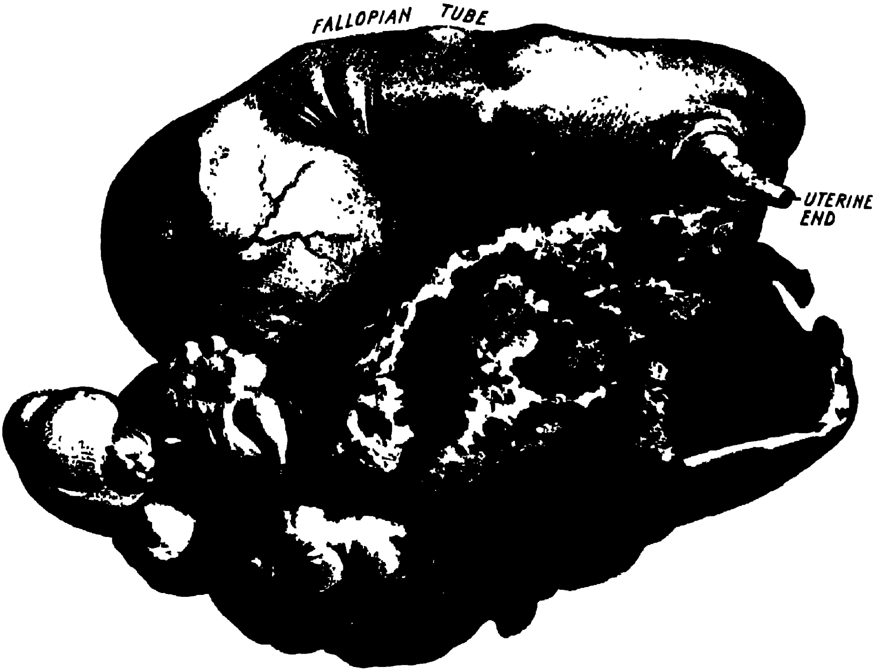

FIG. 183.—PRIMARY CARCINOMA OF THE FALLOPIAN TUBE (Herbert Spencer).[1] The left tube. The cut uterine end is healthy. The growth has perforated the wall in the region of the abdominal ostium.

*Primary cancer* of the tube is a very rare disease, although

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[1] From the *Journal of Obstetrics and Gynaecology of the British Empire.*

Doran has recently (1910) succeeded in collating one hundred recorded cases. It especially affects women who have attained, or have recently passed, the menopause. The growth begins in the tubal mucosa and becomes rapidly diffused from one end to the other; solid masses of soft villous or papillomatous growths are found (fig. 183), which distend the tube in much the same manner as an accumulation of fluid. The abdominal ostium becomes closed by inflammatory changes at a comparatively early period of the disease. In some recorded instances considerable accumulation of fluid also occurred in the tube, so that the condition resembled a hydrosalpinx. In others suppuration had occurred (pyosalpinx). In over one-third of the cases the growth was found to be bilateral when operation or autopsy was performed; in many of the cases recorded as unilateral, a

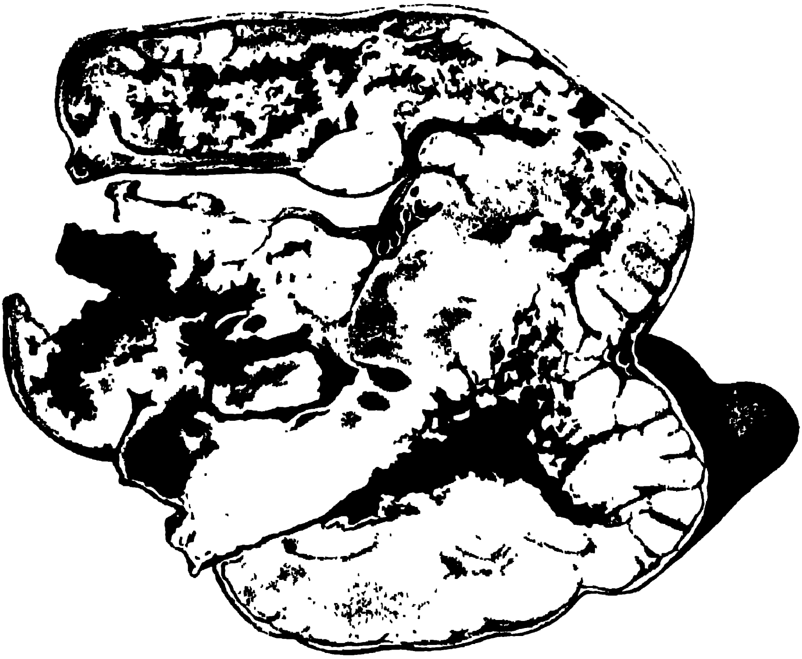

FIG. 184.—PRIMARY CARCINOMA OF THE FALLOPIAN TUBE (Herbert Spencer).[1] The same tube as fig. 183 bisected. The central parts of the growth are papillary in character. The growth has considerably distended the outer part of the tube, the wall of which is intact except at the abdominal ostium.

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[1] From the *Journal of Obstetrics and Gynaecology of the British Empire.*

microscopic examination of the opposite tube was not made, so that the proportion of bilateral cases may be underestimated. In all probability the disease starts upon one side, and rapidly affects the opposite tube by direct transference of cancer cells to it by a process similar to that known in obstetrics as 'wandering' of the ovum. In this connection it is interesting to note that a case has been recorded in which a secondary growth appeared upon the vaginal mucous membrane of the posterior fornix (Spencer). This was no doubt due to implantation of cancer cells which had travelled from the tube through the uterus into the vagina. In the early stages the growth is confined within the tube wall; in the later stages it breaks through and spreads over adjacent structures. Thus the ovary, the peritoneum, the rectum, and sometimes distant abdominal viscera, become secondarily affected.

The histological character of the growth appears to be variable, but the greater number of cases have been described as papillary cancer.

*Diagnosis of Cancer and Papilloma of the Fallopian Tube.* These two growths are allied to one another, give rise to similar symptoms, and cannot be distinguished with certainty except by microscopic examination. The two commonest symptoms encountered are pain, and a watery discharge from the uterus. The discharge is usually free, and forms a characteristic feature ; often it is blood-stained, but not in all cases. It proceeds from the growth and implies that in this condition the uterine ostium remains permeable. Discharge is not, however, invariably met with.

In a number of recorded cases considerable enlargement of the abdomen was present, due in a minority to ascites, in others to the co-existence of an ovarian cyst, or a uterine fibroid. Ascites is by no means a common clinical feature of cancer in the tube.

The swelling formed by the affected tube is large enough to be clinically recognisable as of the size of an orange or, in some cases, of a sausage ; it never attains a large size.

The *treatment* should consist in the complete extirpation of the uterus and the appendages of both sides, by an abdominal operation. The prognosis as regards recurrence is bad according to the series of cases collected by Doran, but in many of them the operation was partial, only the visibly affected tube having been removed.

# PART VIII

# INFLAMMATION OF THE UPPER PORTION OF THE GENITAL TRACT: PELVIC INFLAMMATION

## PELVIC INFLAMMATION

When an inflammatory process attacks any part of the female genital tract it is seldom limited to the organ first affected, but spreads widely, chiefly by continuity over the general epithelial surfaces, but partly by lymphatic or venous absorption so as to involve adjacent tissues. Thus an acute infective vulvo-vaginitis may spread to the urinary tract, the Bartholinian glands, the uterus, Fallopian tubes and ovaries, the pelvic peritoneum and cellular tissue, the general peritoneal cavity, the pleura, and certain lymphatic glands. The advance of the inflammatory process is progressive, and the parts first attacked may, to a great extent, have recovered before the involvement of the more distant parts has manifested itself. In considering the results of inflammation in an organ such as, for example, the Fallopian tube, it is important to remember that the affection of the tube may be, not an isolated occurrence, but a link in a long chain of lesions, traces of which will often be apparent in other parts upon careful search being made for them. The stress of the inflammation is usually much more apparent in one organ than in another, so that such conditions as salpingitis, oöphoritis, and peritonitis may in different cases result from the same infective process, and thus become important clinical and pathological entities. The tube, the ovary, and the pelvic peritoneum are almost invariably affected all together; salpingitis without a certain amount of involvement of the ovary or the pelvic peritoneum is clinically unknown; and again, an attack of pelvic peritonitis, however it may arise, necessarily inflicts considerable damage on the tubes and ovaries.

In considering the effects of inflammation in the various parts of the genital tract it must accordingly be recollected that these are not isolated occurrences, but features or phases of a more or less widespread pathological change in which many structures are involved, although in varying degree. It will therefore be convenient to consider in this section, first the causation of pelvic inflammation, and then the results of inflammatory disease in individual parts of the genital tract, and finally the distinctive features of certain special forms of inflammation such as gonorrhœa and tubercle.

**Etiology of Pelvic Inflammation.**—Pelvic inflammation is due in the great majority of instances to an infective agent introduced into the genital canal from without. The infection may thus begin in the mucous membranes of the vulva and vagina, or may be introduced through lacerations or other injuries of these parts, or of the exposed vaginal portion of the cervix. An infective process of this kind tends to spread to the uterus, the Fallopian tubes, the ovaries, the pelvic peritoneum and cellular tissue, and is distinguished as *ascending* inflammation. Gonorrhœa, sepsis, and, less often, bacillus coli infection, supply characteristic instances of this form of inflammation.

Sometimes the infective agent reaches the genital tract, not from without but from some other organ. Thus the Fallopian tubes and ovaries may be infected from general septic peritonitis arising in the abdominal cavity proper, or from the passage into them of organisms from adherent portions of the intestinal canal, such as a coil of intestine, or the vermiform appendix. Again, in tuberculosis of certain abdominal organs, tuberculous material may be carried by peritoneal currents into the Fallopian tube, and set up a tuberculous salpingitis. When the infection occurs in this way, through some other viscus, the inflammatory process does not tend to spread so widely as in the case of infection from without.

Lastly, the infective agent may circulate in the blood and being deposited in the tissues of, for example, the uterus or ovary, may form foci of inflammation, which are not infrequently multiple, and which show an even less marked tendency to spread than the last-named group. Instances of this kind of infection are to be met with in tubercle, certain of the acute eruptive fevers, such as enteric or smallpox, and pyæmia. They are of much rarer occurrence than those due to ascending or to bowel infection.

The bacteria most frequently met with are the common organisms of suppuration, the streptococcus, staphylococcus, gonococcus, and bacillus coli; more rarely the pneumococcus, typhoid bacillus, Klebs-Löffler's bacillus, and the tubercle bacillus are found. In very rare instances the ray fungus of actinomycosis is the attacking organism. Syphilis has little tendency to cause pelvic inflammation, and up to the present time spirochetae have not been demonstrated as an infective agent in pelvic inflammation. It cannot at present be said that the nature of the attacking organism can be determined from the clinical course of the disease or from the gross changes in the organs concerned. Bacteriological diagnosis in the case of the deep-seated organs cannot be made, as a rule, until operation has afforded an opportunity of directly examining the affected tissues. Recent developments of vaccine therapeutics have rendered this point in many cases one of great importance.

It follows from what has been said that venereal infection and child-bearing are powerful predisposing causes of ascending pelvic inflammation. Acute puerperal sepsis usually leaves no pelvic lesion behind it, but infection of mild virulence, either through lacerations, or through the endometrium, often forms the starting point of a chronic inflammatory process which ultimately may involve the uterus, the uterine adnexa, and the pelvic peritoneum or cellular tissue.

Nulliparous women who are free from venereal taint are the most unlikely to suffer from an ascending infection. Apart from child-bearing, pelvic inflammation of septic origin may occur from infection of the uterus by the use of dirty instruments or by faulty antiseptic technique in operations; and such conditions as an infected or sloughing fibroid in the uterine cavity, or a pyometra, will render the parts of the genital canal above and below the uterus liable to be attacked by the same septic process.

The conditions which predispose to the occurrence of bacillus coli infection are appendicitis and ulceration of the intestinal mucous membrane. The importance of appendicitis as a cause of infection of the tube and ovary of the right side has been established beyond a doubt by many direct observations, during surgical operations upon these organs. The frequency with which, in the female, the vermiform appendix hangs down into the pelvic cavity is estimated by some writers (Robinson) at 48 per cent., and the pelvic position naturally facilitates the adhesion of the appendix to the tube or ovary, and the spread of infection to them. Fig. 185 represents a case in which the operator satisfied himself of the existence of a fistulous communication between the appendix and the tube ; the former is seen to be closely adherent, near its tip, to the abdominal ostium, and the whole tube is thickened and its lumen dilated. In such cases the infection probably spreads to the tube by lymphatic absorption along the lines of adhesion ; the formation by ulceration of a direct communication between the lumen of the appendix and that of the tube

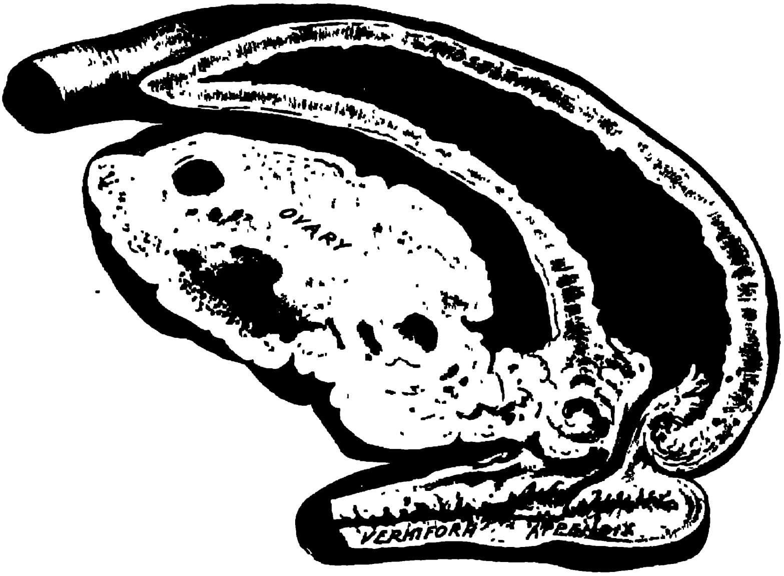

FIG. 185.—TUBO-APPENDICULAR FISTULA (Bland-Sutton). The appendix has become adherent by its tip to the abdominal ostium, and a fistulous communication has been formed in that position. Infolded relics of the tubal fimbriae are seen.

is probably a very rare occurrence, and a late result of the process.

In all forms of bowel infection the Fallopian tube or ovary is the organ first attacked. In dysenteric, typhoid, or stercoral ulceration of the intestine, and possibly in muco-membranous colitis, adhesions may be formed between the gut and the tube or ovary, for coils of the ileum and portions of the pelvic colon and the rectum are normally to be found in the pelvic cavity. Adhesions having been formed, the infection probably reaches the tube by lymphatic absorption; it is very rare for direct communication to be established between the bowel and the tube.

The effects of inflammatory processes in the uterus have been already considered (p. 192); those of inflammation of the vulva and vagina are most conveniently considered in connection with other diseases of these organs. There remains a group of inflammatory processes affecting the Fallopian tubes and ovaries, the pelvic peritoneum and the pelvic cellular tissue; these structures are intimately related to one another, and inflammation originating in one of them extends as a rule to the others. It is therefore convenient to consider them as forming a definite group of lesions, and while each lesion may require separate consideration, it must always be borne in mind that it is normally accompanied by, and closely related to, the others.

## INFLAMMATION OF THE FALLOPIAN TUBES AND OVARIES (SALPINGO-OÖPHORITIS)

The Fallopian tube is an organ specially prone to attack by inflammatory processes. Except perhaps in its slightest manifestations, salpingitis is invariably accompanied by inflammatory changes in the ovary also, and it is therefore convenient to consider inflammation of these two organs as one and the same process. Nevertheless instances occasionally occur in which, while one is affected, the other completely escapes. As a rule the cause of the inflammation is to be sought in one or other of the forms of infection which have been already mentioned. In a few rare instances of chronic salpingitis no such cause can be discovered, and such cases are usually designated *catarrhal*.

In the great majority of cases salpingo-oöphoritis is bilateral, although the changes are often much more advanced upon one side than the other. In cases of ascending infection both tubes are equally liable to be attacked; in cases of bowel infection, on the other hand, one side more frequently escapes.

**Changes in the Tube.**—In the tube the inflammatory changes usually begin in the mucosa, and are especially prominent in the ampullary portion, owing to the complex ramifications of the tubal plicae in that part. These branchings offer a very large epithelial surface and form various crypts and *culs-de-sac*, where infective material may lodge and be detained. In an *acute* inflammation the mucosa becomes swollen, deeply congested, and infiltrated with interstitial hæmorrhages; parts of the epithelial covering are shed. From the intensely inflamed mucous membrane pus may flow through the patent abdominal ostium into the peritoneal cavity, thus draining the tube, and producing an acute peritonitis localised at first to the neighbourhood of the extremity of the tube. Scattered foci of suppuration may then occur in the pelvic peritoneal pouches, or an abscess may form in the ovary, if the bacteria make their way into this organ. If the infective agent is very virulent, it spreads widely in the peritoneal cavity giving rise to general peritonitis or more rarely to a subdiaphragmatic abscess or it may reach the pleura giving rise to an empyema, or by dissemination through the blood stream pyæmia may occur. In a salpingitis as acute as this, occlusion and dilatation of the tube, so common in the chronic form, are not met with. Before the time necessary for these changes to occur has elapsed, the illness will have terminated fatally; or have been cut short by operative interference.

*Chronic Salpingitis.*—This condition may be suppurative or non-suppurative.

In chronic *suppurative* inflammation the epithelial covering is destroyed, the plicae disappear, and the lining of the tube is reduced to an irregular layer of granulation tissue showing marked necrotic changes. In *non-suppurative* inflammation the plicae become thickened from round-celled infiltration, congestion and œdema of the subepithelial tissues, and the epithelial covering is shed in patches (figs. 186 and 187). Adhesion then occurs between adjacent plicae which have lost their epithelium, and by an extension of this process the lumen may be obliterated in parts, or annular areas of the occlusion may thus be formed, cutting up the lumen of the tube into segments. Occlusion of the abdominal ostium occurs in almost all chronic cases. In some cases the inflamed fimbriae adhere to one another by their mucous surfaces, and by cicatrisation of the granulating surfaces the ostium becomes firmly closed (salpingitic occlusion). Traces of the fimbriae, in the form of a small rosette, usually remain visible upon the surface indicating the position of the sealed aperture, as is seen in fig. 193; or, becoming inverted, may be seen upon the inner aspect on opening the tube (fig. 185). In other instances secretions from the inflamed tubal mucosa, escaping at the abdominal ostium, set up adhesive peritonitis in its neighbourhood, which results

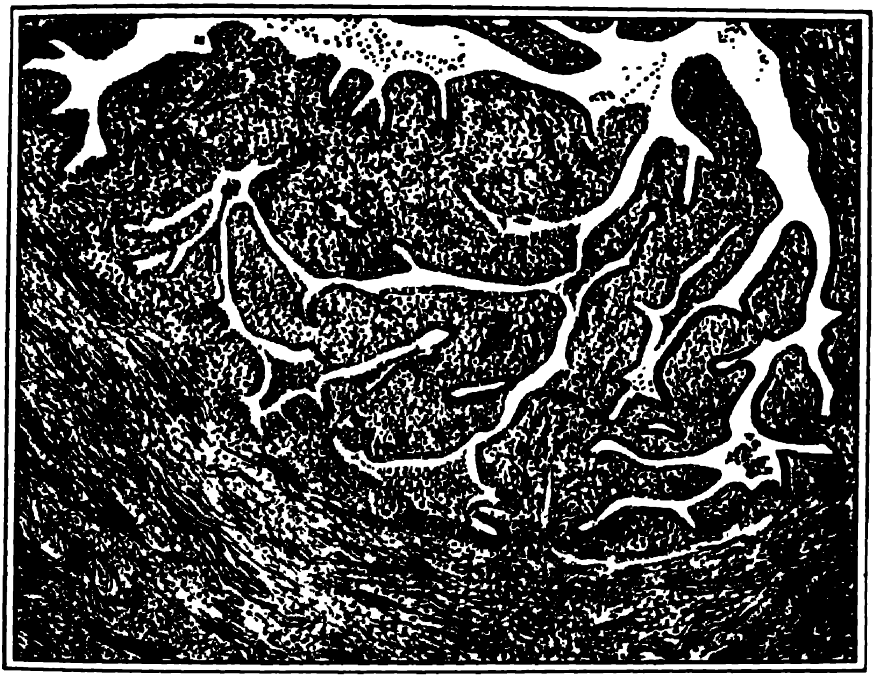

FIG. 186.—CHRONIC SALPINGITIS; FROM THE AMPULLA OF THE TUBE. The plicae of the tubal mucosa are thickened by increase of the stroma; the epithelium has been shed in small patches.

in the fimbriae becoming closely adherent to some adjacent structure (peritonitic occlusion). The abdominal ostium may thus become firmly fixed *en masse* to the surface of the ovary or to the broad ligament before any adhesions have been formed in other parts of the tube. Sometimes the fimbriated end adheres to the back of the uterus, the floor of the pouch of Douglas or the broad ligament; sometimes to the intestine, or to the lateral pelvic wall. Even when, later on, general tubal adhesions are formed, those at the abdominal ostium are usually the densest of all. This seals the tube as effectually as the former method. Owing to the narrowness of its lumen, the uterine end (interstitial portion) becomes mechanically closed by swelling of the

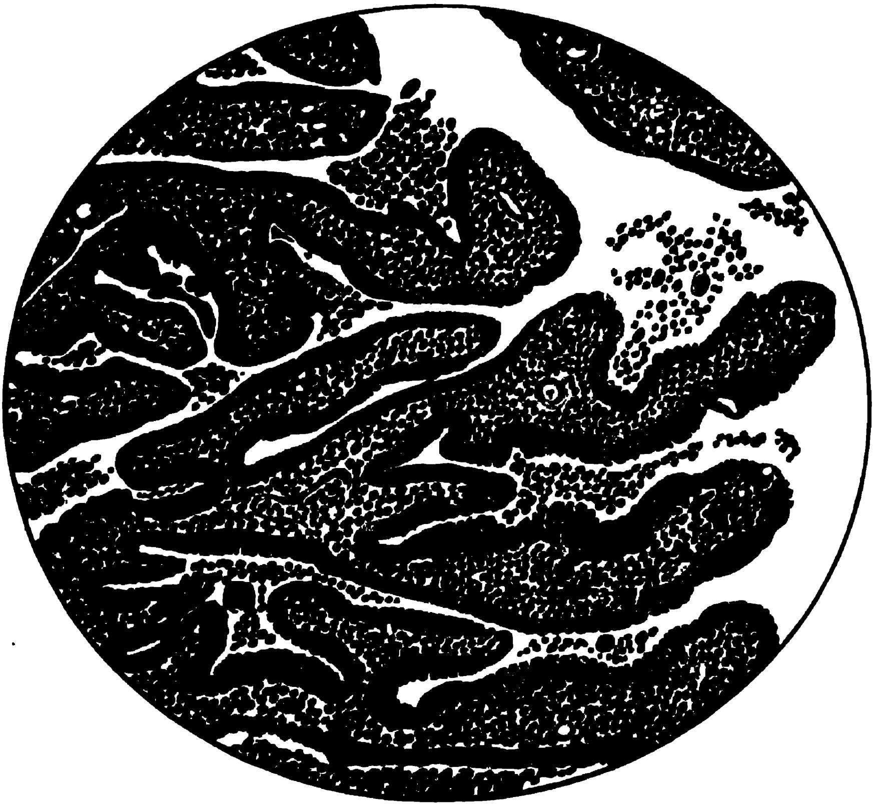

FIG. 187.—CHRONIC SALPINGITIS. Under a high power the round-celled infiltration of the stroma is seen; detached and swollen epithelial cells are present in the interstices.

mucous membrane at an early stage of the disease; in any case it is probable that drainage into the uterine cavity through this narrow portion is impossible. Organic occlusion is seldom found at this end of the tube.

The changes which the tube undergoes subsequent to its occlusion depend upon the severity of the inflammatory process, and the degree of rapidity with which fluid accumulates in the closed tube. In certain chronic cases the inflammatory changes spread to the muscular coat resulting in considerable thickening and induration of the tube wall, which sometimes attains a depth of one-half to three-quarters of an inch (fig. 190). The increased resistance offered by the thickened walls prevents any great distension from occurring, and comparatively little fluid is produced. The peritoneal coat becomes inflamed at an early stage; as a result the tube becomes bound down by adhesions to adjacent structures, and, when subsequently thickening and dilatation occur, more or less pronounced distortion results. Thus the

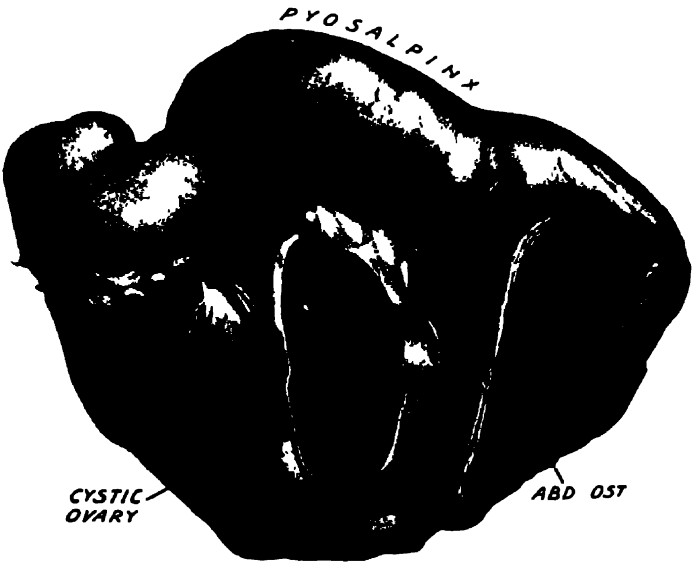

FIG. 188.—CHRONIC PYOSALPINX. Patient aged 27; gonorrhœal infection. The tube is not much dilated, its outline is convoluted and its walls are thickened. The ovary is enlarged, cystic, and firmly adherent to the tube.

tube may become convoluted (fig. 188) or bent upon itself at an angle (fig. 190), when it dilates irregularly; or from obstruction of the lumen, a portion only may become dilated. Tubes which are not much thickened or encumbered by adhesions show the most marked dilatation; this is always greatest at the outer part or ampulla, becoming gradually less as the uterus is approached, and at some part of the isthmus an acute bend generally occurs giving the distended tube the *retort shape* which is so characteristic (fig. 191). Tubes which are not densely adherent, and have thickened walls, dilate more regularly, producing the banana shape seen in fig. 189, or the sausage shape of fig. 192. The largest tubal swellings are retort-shaped, and in some such cases the distended tube has attained the size of the fœtal head at term.

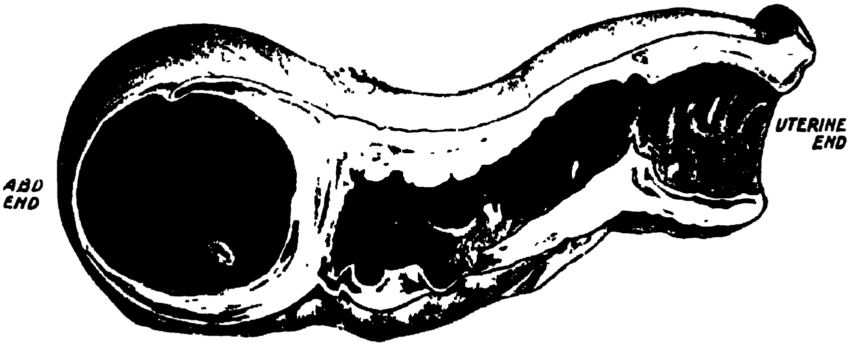

FIG. 189.—CHRONIC PYOSALPINX (Charing Cross Hospital Museum). The dilatation is fairly uniform, the tube wall is thickened, and a septum is formed near the abdominal end.

A tube which has become occluded at the abdominal end, and subsequently distended by the accumulation of fluid in its interior, is called a *sactosalpinx*. In all cases the dilatation chiefly affects the ampullary portion. Three varieties of sactosalpinx may be described, according to the nature of the fluid which they contain. Sometimes the fluid is thin, non-purulent, and only slightly coloured, when the tube is called a *hydrosalpinx*; sometimes the contents consist of pus alone, or of a distinctly purulent fluid, when the tube is called a *pyosalpinx*; sometimes the tube contains fluid or clotted blood alone, or a fluid containing a large proportion of blood, when it is called a *hæmatosalpinx.* The nature of the contents is a point to which too much importance should not be attached, but other points of difference between these three varieties can be defined and should also receive attention.

The great majority of cases of *hæmatosalpinx* are not of inflammatory origin at all, but result from *tubal pregnancy* (see p. 455); in a small minority, however, no evidence of gestation in the tube can be found, and the condition appears to result from a hæmorrhagic form of salpingitis. In such cases the fluid may be purulent with a large admixture of blood, and in other respects the tube may resemble a pyosalpinx.

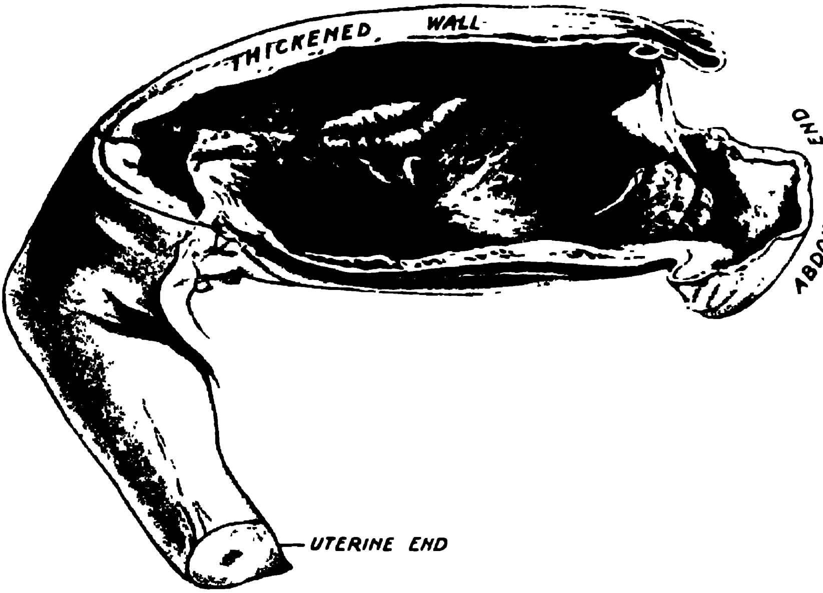

FIG. 190.—CHRONIC PYOSALPINX (Charing Cross Hospital Museum). The tube is bent at a right angle, the outer part alone being dilated. The tube wall is thickened throughout. From the same case as fig. 188.

Pyosalpinx and hydrosalpinx present many points of difference from one another. In pyosalpinx the walls of the tube are thickened, and, as a rule, more or less densely adherent throughout their whole length to surrounding structures; the surface of the ovary is inflamed and adherent (peri-oöphoritis), and sometimes foci of suppuration are found in it. In hydrosalpinx the walls of the tube are generally thinner than normal, membranous and often translucent, while the adhesions are fewer and usually consist

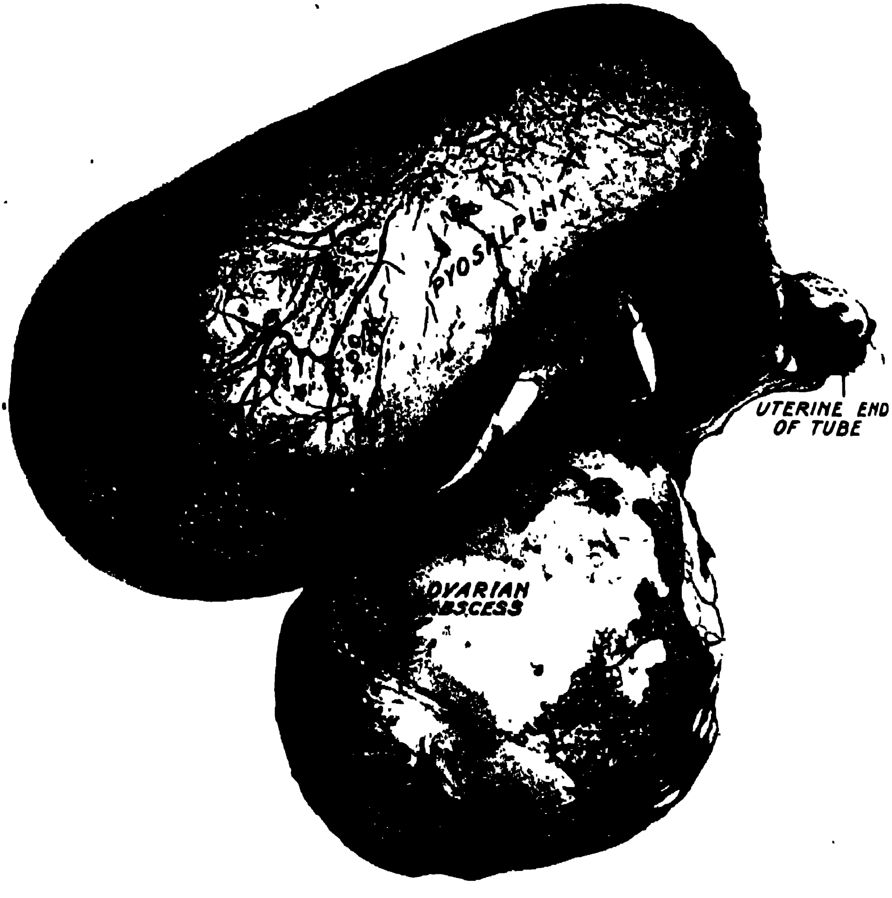

FIG. 191.—TUBERCULOUS PYOSALPINX AND OVARIAN ABSCESS. Nullipara, aged 21. The dilated tube shows the characteristic retort shape. Both tube and ovary are studded with tubercles; they are almost entirely free from adhesions.

of isolated bands; the ovaries may be healthy, and even if affected, the signs of inflammation in them are slight. In exceptional instances a pyosalpinx may be found free from adhesions at all parts except the abdominal ostium (fig. 191); here adhesion to surrounding structures accompanies the process of occlusion by either method. This general freedom from adhesions probably indicates a low degree of virulence of the infecting organisms.

In all forms of sactosalpinx the arborescent arrangement of the tubal plicae in the ampulla is to a great extent lost, the plicae being at first flattened out and then atrophied from the effects of tension. In hydrosalpinx remains of atrophied and flattened plicae usually persist, except in those of very large size; here they are lost and an epithelial covering of more or less flattened cells alone remains. In pyosalpinx extensive destruction of epithelium from suppuration has occurred, and the mucosa is often almost entirely replaced by granulation tissue.

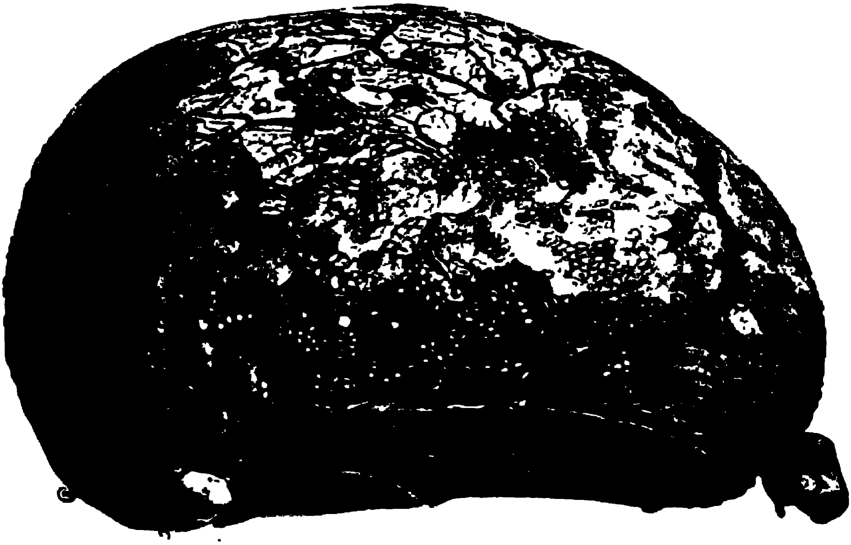

FIG. 192.—TUBERCULOUS PYOSALPINX. From the same case as fig. 191. The dilatation is roughly cylindrical or sausage-shaped and the tube wall is studded with tubercles.

It is not at all uncommon to find that the contents of a pyosalpinx are sterile, the bacteria having perished from exhaustion of their pabulum. The purulent fluid is usually yellowish or greenish in colour, of creamy consistence, and is not as a rule offensive in odour.

The *etiology of hydrosalpinx* has been the subject of considerable discussion. That its origin is inflammatory cannot be doubted, for the closure of the abdominal ostium, and the almost invariable presence of surface adhesions sufficiently demonstrate this. In the view of some observers it represents the late stage of a pyosalpinx, the fluid contents having originally been pus. Certain anatomical facts are, however, very difficult to reconcile with this view; in a hydrosalpinx of small size the tubal epithelium is preserved, while in pyosalpinx it is always more or less destroyed; in hydrosalpinx the tube wall is thin and translucent (fig. 193), in pyosalpinx it is always abnormally thick and dense; in no other abscess that we know of do we find pus converted into clear serous fluid. It appears much more probable that, if hydrosalpinx is inflammatory at all, it results from an inflammation which from its onset is non-suppurative, but attended by the production of serous fluid.

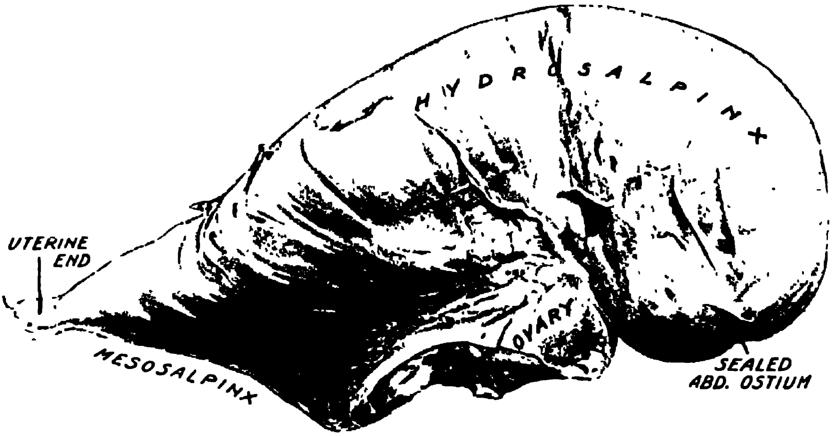

FIG. 193.—HYDROSALPINX (Royal College of Surgeons Museum). The specimen shows the characteristic retort-shaped dilatation, and at the outer end a puckered depression indicating the position of the abdominal ostium. The ovary has been partly cut away.

Certain observers have advanced the view that hydrosalpinx is really a congenital condition due to an error of development, in which the upper extremities of the Müllerian ducts are imperfectly canalised. The mode of closure of the abdominal ostium is, however, precisely similar to that associated with salpingitis, and the occlusion is therefore in all probability of inflammatory origin. But it is possible that in such cases the inflammation affects only the outer wall of the tube and its abdominal ostium, the mucous membrane escaping (perisalpingitis). Dilatation of the tube would then result from inflammatory occlusion, leading to accumulation of the normal secretions of the unaltered tubal mucosa. Experimentally hydrosalpinx may be produced in rabbits and guinea-pigs by ligaturing the healthy tube in two places, when dilation will occur in the part of the tube which lies between the ligatures. In these animals the tube is but a prolongation of the uterine cornu, and the tubal secretion probably drains freely either into the uterus or into the peritoneal cavity; in the human species it appears probable that the only condition necessary to the production of a hydrosalpinx is an occlusion of the outer end of the tube; an inflammatory change in the mucosa is not an essential part of the process at all.

*Intermittent Hydrosalpinx.*—The view has been sometimes advanced that in some cases of hydrosalpinx the fluid contents may be evacuated from time to time through the interstitial portion of the tube, the fluid being forcibly propelled by peristaltic contractions of the muscular wall of the tube into the uterus.

In considering this view it must be recollected that the lumen of the interstitial portion of the tube is only large enough to admit a bristle (1–2 mm.), and that it passes through the whole thickness of the dense fibro-muscular and elastic structures forming the uterine wall. Great force would accordingly be required to propel tubal fluid through it into the uterus. It appears extremely unlikely that the attenuated wall of a hydrosalpinx could contain sufficient muscle for the purpose. No hydrosalpinx has ever been seen in which the interstitial portion of the tube was dilated, and apart from this it is very difficult to believe that spontaneous evacuation in this direction can occur. Dilatation of the uterine end of the tube has been demonstrated in a case of pyosalpinx associated with a fibroid tumour (Cadenat), but here there was no clinical history of a discharge of pus. In cases of interstitial tubal pregnancy and in cases of tubal cancer it has been demonstrated that blood may pass from the tube into the uterus and so escape externally. The conditions in the former, however, are entirely different from hydrosalpinx, inasmuch as the muscular contractility of the tube is little, if at all, impaired by distension and thinning. In the latter the disease often invades the interstitial portion of the tube itself, which facilitates escape of blood into the uterus.

**Rupture of a Sactosalpinx.**—This accident occurs not infrequently with a hæmatosalpinx resulting from tubal pregnancy. It is probable that a hydrosalpinx may rupture spontaneously, without giving rise to any clinical phenomena whatever, and there is accordingly no means of estimating its frequency. Spontaneous rupture of a pyosalpinx into the peritoneal cavity is very rare, owing to the fact that as a rule the tube wall is too much thickened and too densely adherent to surrounding structures to permit of this accident. Nevertheless forty-eight cases have been collated by Bonney (1909), and the grave nature of the occurrence is made clear by the fact that 48 per cent. of these cases terminated fatally.

**Tubal Fistulae.**—In chronic cases of pyosalpinx fistulous communications may be formed between the tube and one of the hollow viscera, by gradual destruction, through ulceration, of the septum formed by the adherent walls. Most commonly the communication is formed with the intestine—the upper part of the rectum, the pelvic colon, or a coil of ileum being the parts usually implicated. In rare cases a fistulous communication may be formed between the vermiform appendix and the tube (fig. 185). Next in frequency to the intestine comes the vaginal vault; a pyosalpinx commonly occupies the pouch of Douglas and is therefore adjacent to the vagina, but the intervening tissues are thicker and denser than in the case of the intestine. Lastly and least frequently the pyosalpinx may discharge into the bladder; the infrequency with which a dilated tube is found in the utero-vesical pouch explains the rarity of this form of tubal fistula. A number of instances are recorded where right and left dilated tubes have communicated with one another.

The formation of a tubal fistula is a curative process and may be followed, in some cases, by obliteration of the canal of the tube, and permanent cure. More frequently drainage is inadequate, reaccumulation occurs, and the fistula simply persists. Cystitis does not necessarily follow the formation of a tubo-vesical fistula, for the pus may be destitute of living organisms.

*Tubo-ovarian Fistulae.*—Sometimes a sactosalpinx comes to communicate directly with the cavity of an ovarian cyst or abscess, and the resulting condition is often distinguished as a '*tubo-ovarian cyst or abscess.*' It is also possible that an undilated tube may sometimes be thrown into communication with an ovarian cyst. Close adhesion of the tube to the cyst is the necessary antecedent condition, the actual communication being then established by ulceration, or by atrophy of the intervening tissues from pressure. Sometimes traces of the tubal fimbriae may be found around the aperture of communication, indicating that the abdominal ostium was the part of the tube which had been perforated. These fistulae are of little practical importance, and careful examination of the specimen after removal is required for their recognition.

**Inflammatory Changes in the Ovary.**—Inflammation of the ovary is due to the same causes as inflammation of the tubes. There are two different ways in which the ovary may be attacked: (1) The inflammatory process may spread from the tube or from adjacent peritoneal surfaces, resulting in the formation of ovarian adhesions, and thickening of the superficial layers of the cortex (*peri-oöphoritis*). (2) Bacteria may penetrate the ovarian tissues through a ruptured Gräafian follicle, or may be deposited in it by the blood and lymph streams (*interstitial oöphoritis*).

A *Peri-oöphoritis* is of frequent occurrence, the commonest precedent conditions being salpingitis and pelvic peritonitis. The adhesions may bind the ovary firmly to the tube, the back of the broad ligament, or the floor of the pouch of Douglas. In a large proportion of cases the ovary, in addition to being adherent, is also enlarged from the formation of numerous small unilocular cysts, resulting from non-dehiscence or cystic degeneration of Gräafian follicles (see fig. 194). It is probable also that the inflammatory changes may lead directly to this cystic formation, since the thickened tunica albuginea may impede or prevent the ripening and dehiscence of the Gräafian follicles. The frequency with which adherent ovaries are also cystic is well established by clinical observation.

B *Interstitial oöphoritis* may be acute or chronic. In the acute form the cause is usually to be found in indirect infection from a septic endometrium, or in direct infection by the blood stream, as in certain of the acute fevers. The typhoid bacillus and the pneumococcus have in such cases been repeatedly demonstrated in the pus from an ovarian abscess. Sometimes the Gräafian follicles, sometimes the ovarian stroma, are chiefly affected, and pus formation, either diffused, or in the form of a localised abscess, is not uncommon; multiple follicular abscesses are also sometimes formed under these circumstances. In the *chronic* form interstitial oöphoritis is rare except as an accompaniment of chronic salpingitis; here the formation of pus in the ovary is not uncommon, and the organ may become much enlarged and indurated (fig. 191). It is probable that the cystic spaces formed as a consequence of peri-oöphoritis may ultimately become infected, giving rise to follicular abscesses; or the same result may follow the formation of a tubo-ovarian fistula. It is extremely rare for interstitial oöphoritis to occur without the surface of the ovary being also affected and becoming adherent to adjacent structures.

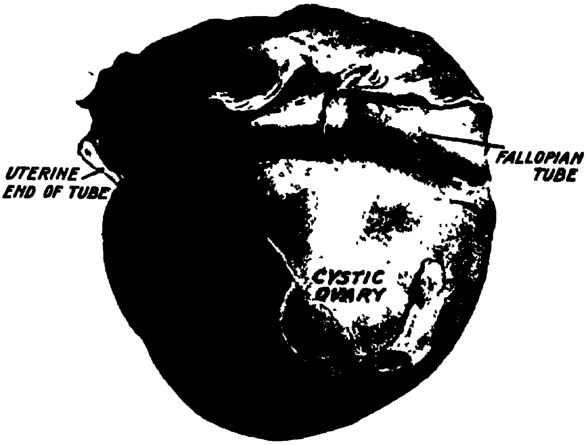

FIG. 194.—CHRONIC SALPINGO-OÖPHORITIS. Multipara, aged 43. The ovary is enlarged by cystic formation; the tube is not dilated, but closely adherent to the upper part of the ovary, the mesosalpinx being concealed by the adhesions.

**General Relations of Tubal and Ovarian (Adnexal) Swellings.**—Tubes and ovaries, enlarged by inflammatory processes, tend to descend to the floor of the pouch of Douglas, where they become adherent to those of the opposite side, and to the back of the uterus. But the inflamed ovary may become so firmly adherent to the back of the broad ligament that it is held up in approximately its normal position. The enlarged tube then sinks over the posterior surface of the ovary so as partly to conceal the latter when inspected from above, and as the enlargement of the ovary increases the broad ligament becomes stretched over it so as to form for it a hood-shaped covering—the *broad-ligament hood,* in which it may be almost completely concealed. Dilated tubes of large size usually fall into the pouch of Douglas; sometimes they are held up by omental or bowel adhesions, and may be found lying entirely above the level of the pelvic brim. Anterior displacements of inflamed tubes and ovaries are relatively very uncommon. In almost all cases of suppurative inflammation a densely matted covering is formed above the tubes and ovaries, consisting of omentum and intestine; this may entirely cover in the pelvic cavity and thus limit the area of infection. Its detachment often causes the operator considerable trouble when dealing with such conditions by abdominal section. In rare cases, however, the inflamed tube may be found free from adhesions except at its abdominal ostium (see fig. 191).

## INFLAMMATION OF THE PELVIC PERITONEUM AND CELLULAR TISSUE

It has been already mentioned that a certain amount of peritonitis always occurs in the neighbourhood of inflamed tubes and ovaries. The tendency of the inflammation to spread from the latter organs to the cellular tissue is, however, much less evident, and except in chronic suppurative cases there is no appreciable degree of pelvic cellulitis. Occasionally, however, the stress of an ascending infective inflammation falls, not upon the tubes and ovaries, but upon the peritoneum itself or the cellular tissue, giving rise to pelvic peritonitis or cellulitis. Recent extensions of the operative treatment of inflammatory pelvic lesions have shown that such cases are comparatively rare, and it is probable that a large proportion of the ~~cases regarded by~~ earlier clinical observers as cellulitis or peritonitis were in reality cases of tubo-ovarian inflammation. Pelvic peritonitis necessarily involves the surface of the tubes and ovaries, inflicting a certain amount of damage upon them; the cellular tissue may, however, be the seat of extensive inflammatory changes without affecting either the peritoneum or the uterine adnexa to any considerable extent.

**Pelvic Cellulitis (Parametritis).**—This is the rarest form of pelvic inflammation, and is usually due to lymphatic absorption of septic organisms through a cervical injury. Such cases are therefore usually puerperal, but sometimes they follow operative procedures in which cutting or tearing of the cervical tissues has occurred. Successful antiseptic technique in obstetric and gynaecological work has probably greatly reduced the incidence of this form of the disease. The inflammatory effusion begins in the broad ligament on the same side as the cervical injury, which is nearly always lateral. The pelvic cellular tissue is, however, a continuous sheet passing upwards to join that of the abdomen, and sending out sheaths around the vessels and nerves which pass out of the pelvic cavity into the lower limbs. Accordingly the inflammatory changes tend to spread widely; thus the ring of cellular tissue surrounding the supra-vaginal cervix and the opposite broad ligament will be involved; the utero-sacral folds and the peri-rectal cellular tissue may be affected; and by continuity the cellulitic process may spread upwards along the ureter to the renal fatty capsule, anteriorly to the abdominal parietes, and through the pelvic foramina into the buttock and the thigh. Downward extension of the inflammation is limited by the pelvic diaphragm (see p. 149).

The change at first consists of an effusion of inflammatory lymph into the spaces of the cellular tissue, and owing to the tension thus produced the affected tissues feel hard and densely resistant. In a certain proportion of cases the effusion becomes slowly absorbed, and normal conditions are in the end restored completely. In some cases, however, absorption is incomplete and areas of inflammatory thickening remain, it may be in the pelvic cavity, or, when the inflammation has spread widely, in some distant part such as the iliac fossa or the renal fossa. These distant inflammatory relics were recognised by Matthews Duncan and named by him 'remote parametritis.' Suppuration occurs in a considerable number of cases and the abscess may form in any part of the effusion; sometimes an area of 'remote parametritis' suppurates after the pelvic effusion has been absorbed. A cellulitic abscess tends to point in the majority of cases above the inner half of Poupart's ligament, since the effusion spreads most readily beneath the shallow anterior layer of the broad ligament and so reaches the abdominal parietes. In rare instances the abscess may point posteriorly above the sacro-iliac synchondrosis, or may pass into the buttock through the sacro-sciatic notches, or into the adductor region of the thigh through the obturator canal, or along the femoral canal into Scarpa's triangle. In very rare instances a cellulitic abscess appears to have discharged into the bladder, the rectum, or the vagina.

Thickening and cicatricial contraction may occur in the broad ligaments, or in the utero-sacral ligaments as sequelae of cellulitis. These lesions are usually entirely inactive and give rise to no symptoms. Contraction of the broad ligament upon one side will cause lateral displacement of the uterus; contraction of the utero-sacral ligaments may be a contributory cause of pathological anteflexion. Both conditions tend to impair the mobility of the uterus.

**Pelvic Peritonitis (Perimetritis).**—This condition is of more frequent occurrence than pelvic cellulitis, for the pelvic peritoneum may be attacked by an ascending inflammation from the tubes, or by direct lymphatic absorption from an infected uterine cavity. In puerperal infection of the uterus direct spread by lymphatic channels through the uterine wall may occur; in gonorrhœa and septic salpingitis escape of infective material through the unclosed abdominal ostium often occurs; more rarely a pyosalpinx or an ovarian abscess lying in the pelvic cavity may rupture, allowing of the escape of infective material. It may also be attacked from above by direct spread of inflammation from the general peritoneal cavity, or from deposition in it, from some abdominal focus, of infective material. The commonest example of the last-named condition is appendicitis, in which the formation of an intra-peritoneal pelvic abscess frequently occurs. Acute inflammation limited to the pelvic portion of the peritoneum is, however, almost always due to a preceding infection of the genital tract.

The deep fossa forming the pouch of Douglas bears the brunt of the changes which occur in pelvic peritonitis. It is there, in nearly all cases, the inflammatory process starts, and the effusion collects. Consequently this condition is characterised by the formation of a swelling behind the uterus. The tubes and ovaries, if not the source of the peritonitis, are necessarily involved in it, and the process often spreads in front of the uterus into the utero-vesical pouch. Its ~~upward~~ spread is checked, in all but the most acute cases, by the rapid formation of a protective zone of plastic inflammation involving the lower abdominal viscera; omentum, coils of intestine and mesentery becoming firmly adherent to one another, to the fundus of the uterus, to the upper borders of the broad ligaments, and to the abdominal parietes. Thus the process remains limited to the pelvic cavity, except in instances where the organisms are sufficiently virulent to infect the abdominal peritoneum, before time enough has elapsed for the plastic peritonitic reaction to occur. Within the area thus isolated more than one collection of pus may be found; in addition to the main effusion in the pouch of Douglas, smaller pockets of fluid may form between adjacent coils of gut, or between adherent bowel and the pelvic wall. Foci of this kind are also frequently met with in the limiting roof of adhesions.

Pelvic peritonitic effusions may be completely absorbed without suppuration; in such cases considerable damage to the pelvic organs proper remains, such as adhesions between the uterus and the floor of the pouch of Douglas, or adhesions of the uterine adnexa to intestine and other parts, or peritonitic closure of the Fallopian tubes. Whether this damage is in all cases permanent, or may be gradually repaired, is at present an open question. When the effusion suppurates the resulting ~~abscess sooner or~~ later opens into the rectum, or some other part of the intestine, or more rarely into the vagina or the bladder. It is possible that completely isolated collections of pus may persist, and gradually becoming sterile may be absorbed.

Sometimes collections of non-purulent fluid also resist absorption and remain as encysted collections of serous fluid (*serous perimetritis*).

It follows from what has been said as to its causation that *pelvic cellulitis* is rare, occurring almost exclusively as a puerperal affection, and that its frequency has been greatly diminished by antiseptic midwifery. On the other hand, *pelvic peritonitis* in its chronic form is fairly common, occurring sometimes repeatedly in the course of suppurative inflammation of the adnexa; more rarely it occurs in an acute form in cases of appendicitis, or in septic or gonorrhoeal infection.

## DIAGNOSIS OF PELVIC INFLAMMATION

As has been already explained, the group of inflammatory affections included as salpingo-oöphoritis, pelvic cellulitis, and pelvic peritonitis are intimately related to one another. This relationship is as apparent in their clinical features as in their pathological characteristics. The symptoms to which they give rise are not dissimilar, and are characteristic merely of a *pelvic inflammation*, acute or chronic as the case may be. The history of the patient's illness will often reveal the nature and cause of the infection. Exact diagnosis is much more difficult in acute than in chronic cases, for lapse of time, and the progress of the physical signs of the disease, are often of great service in determining the position and nature of the principal lesions in a given case. Continued observation and repeated examinations are often required to discover the principal focus of infection.

**General Symptoms in Acute Cases.**—Acute cases which develop rapidly and are attended by severe symptoms are much more often due to peritonitis or cellulitis than to tubo-ovarian inflammation. Sometimes cases occur in which grave symptoms indistinguishable from those of perforative peritonitis rapidly develop, without any localising signs being discovered in the pelvis. More frequently the onset is less severe and two main symptoms manifest themselves, viz. fever and pain; vomiting, except during the first few hours, is rare. The fever is usually severe, running up to 103° or 104° F., and may be associated at its onset with a definite rigor, or with attacks of chilliness. A rigor is more often met with in an acute cellulitis than in any of the other conditions. Thereafter the temperature runs an irregularly intermittent course, similar to that of septicæmia. The fever in some cases subsides rapidly and in a few days the temperature becomes normal: this indicates that the inflammatory focus is peritonitic and has been successfully isolated by adhesions. In some cases the fever is prolonged and shows little variation from day to day; this is characteristic of cellulitis, in which condition the advance of the inflammation is not checked by any natural protective process. In other cases recurrences of high fever occur with intervals of abatement; this is seen when a peritonitic or salpingitic inflammation succeeds in passing the barrier and invading fresh regions of the upper abdomen, or when suppuration occurs in an isolated effusion.

The pulse rate is quickened, as a rule, proportionately to the temperature. When the pulse rate is abnormally rapid generalised infection is probably occurring.

Abdominal pain and distension, both limited to the hypogastric zone, are commonly met with except in cellulitis, when both may be absent; they are in a special sense indications of peritonitis, and when occurring in a case of cellulitis, they indicate that considerable involvement of the peritoneum has also occurred. Great tenderness on abdominal pressure is also present, and defæcation and micturition may become painful. The leucocyte count is moderately high, and the general condition of the patient, as indicated by the condition of the tongue, and the ability to take nourishment, is fairly good.

The symptoms indicative of abscess formation are not in all cases clear. Rigors may be absent, and the fever is not invariably exacerbated. A great increase in the leucocyte count occurs, and after a time the general condition of the patient deteriorates, the pulse quickens, and sweating occurs; rapid emaciation, and the appearance of a peculiar earthy tint of the skin, may be seen in prolonged cases. Abscess formation may occur in a few days in cases of acute pelvic peritonitis, and if it occurs at all is seldom delayed beyond the second week; in cellulitis its occurrence is much later, being seldom seen before the fifth week (Cullingworth), and being often delayed until the tenth or twelfth week.

**General Symptoms in Chronic Cases.**—Chronic cases, attended by pain and by prolonged ill-health, are much more often due to tubo-ovarian inflammation than to peritonitis or cellulitis.

In the great majority of cases of chronic tubo-ovarian inflammation, there is a prolonged history of pain and general ill-health which can be traced to a confinement or an abortion, or to an attack of gonorrhœal infection. In puerperal cases there may be no definite history of septic infection, but merely a retarded convalescence; or the onset of symptoms may be delayed for a period of several weeks or months after the occurrence of the confinement or abortion. In gonorrhœal cases an interval even more prolonged may elapse between the original infection and the appearance of symptoms of pelvic inflammation. It will be found on inquiry that during this interval the general health has been unsatisfactory, and that the symptoms of gonorrhœa have not been entirely relieved. Sterility also almost always characterises this interval.

In women who are virgins bowel infection and tubercle are the commonest antecedents, while in parous women any of the possible causes, or a combination of them, may be met with.

An important feature of cases of chronic pelvic inflammation, and one which is frequently present, is the occurrence of intercurrent acute attacks or exacerbations at irregular intervals. These intercurrent attacks reproduce the general features of acute pelvic inflammation, and are usually attended by abdominal pain and fever, slight or moderate in degree. Often they are sufficiently severe to necessitate confinement to bed for several days, but the attacks are not necessarily so severe as this. Their onset is frequently synchronous with a menstrual period. They do not, of necessity, indicate the presence of suppuration, but they do imply that the infective agent is still active in the inflammatory focus.

In the quiet phases chronic inflammatory lesions give rise to few symptoms, the most troublesome being pain, which is felt chiefly in the lumbar and iliac regions, and is aggravated to so marked an extent by exertion that the patient becomes disinclined to effort of any description and falls into a state of chronic invalidism. Dysmenorrhœa of the congestive type, menorrhagia, and leucorrhœa are nearly always present, and probably arise in part from associated chronic infection of the endometrium or the vagina. Dyspareunia and sterility are common, and sooner or later a train of hysterical symptoms often becomes superimposed which may distract attention from the true cause of the illness. Occasionally gross pelvic lesions come in time to be tolerated extraordinarily well and give rise to little or no trouble, the probable explanation being that the infective agent has entirely lost its virulence. Thus a pelvic abscess of considerable size may be discovered in cases where no indication of its presence was afforded by the temperature or the general condition of the patient.

It will be clear from what has been said that pelvic inflammation gives rise to a train of symptoms which are fairly characteristic both in their acute and chronic phases. But the nature of the lesions which may be present cannot be determined except by careful local examination, for the symptoms do not enable a case of salpingo-oöphoritis, for instance, to be distinguished from one of pelvic peritonitis.

**Tubo-ovarian Inflammatory Swellings.**—The swelling formed by *inflamed adnexa* almost invariably lies in the posterior compartment of the pelvic cavity (figs. 195 and 196), although occasional exceptions have been recognised. As a rule the swelling is not mesial but postero-lateral in position, and in something like 75 per cent. of cases both sides can be felt to be involved, either in the form of a single mass of large size, or of two distinct swellings, that on one side being appreciably larger than that on the other. In other cases, while a definite swelling is formed upon one side, only an ill-defined thickening of the tube and ovary is to be felt upon the other. The actual characters of the swelling itself are varied. The outline of the affected tube and ovary is often obscured by the presence of surrounding exudative or plastic peritonitis; the result is the formation of a firm, fixed, tender mass in the position indicated, the nature of which can only be inferred by deduction. In other cases more detail can be recognised; thus a cord-like attachment of the swelling to the uterine cornu of the same side may be felt (see fig. 195), or the outline of a curved structure like the crooked finger may be made out representing the tube, and a globular or oval portion representing the ovary (fig. 196). When suppuration has occurred, details of this kind can rarely be recognised owing to the amount of surrounding peritonitic thickening

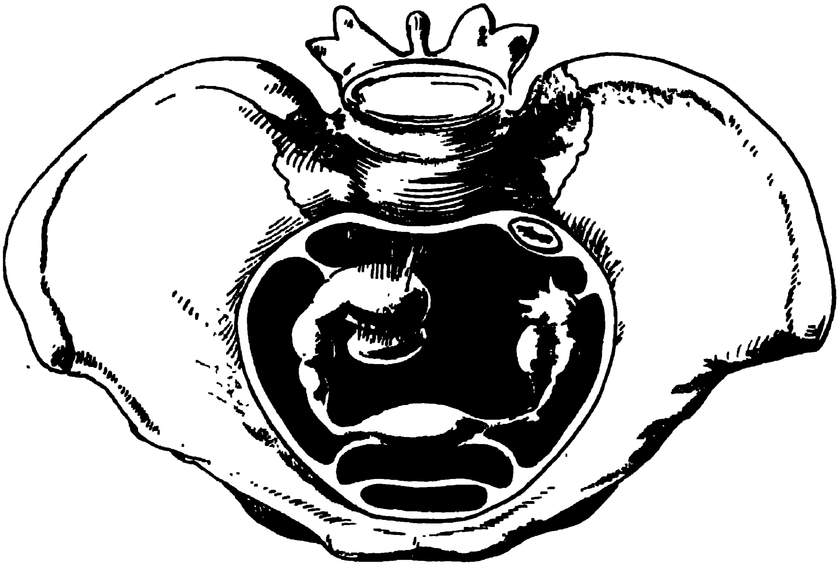

FIG. 195.—TUBO-OVARIAN INFLAMMATORY SWELLINGS (Martin). Representing diagrammatically the position and character of the swellings. The right tube is sealed and dilated, and adhesions have been formed with the ovary and the peritoneum of Douglas's pouch. The left tube is thickened but not sealed.

which is present. The rectal bimanual examination should ~~always be practised~~ in these cases, for it will show the close relation of the swelling, when large, to the anterior rectal wall; the finger in the rectum is able to reach the lower and posterior surfaces of a swelling in the pouch of Douglas, while from the vagina only the anterior surface can be felt. Rectal ~~examination is therefore of great~~ value in the diagnosis of cases of inflamed adnexa.

Occasionally swellings of this nature are large enough to extend above the pelvic brim and to be felt on abdominal palpation; more rarely still cases occur in which a pyosalpinx or hydrosalpinx has been found drawn up into the abdominal cavity proper, so as to lie entirely above the pelvic brim. When a large amount of surrounding thickening and fixation is present suppuration has probably occurred; when there is little thickening and the affected tube and ovary are comparatively soft and not entirely fixed, the presence of pus is improbable. Even when the appendages of one side appear on examination to be but slightly, if at all, affected, operation may unexpectedly reveal extensive changes in them; prognosis in this respect must therefore be cautious. A general anæsthetic is of course a great aid to accurate diagnosis in all cases, and is indispensable when the conditions are very unfavourable to a satisfactory bimanual examination.

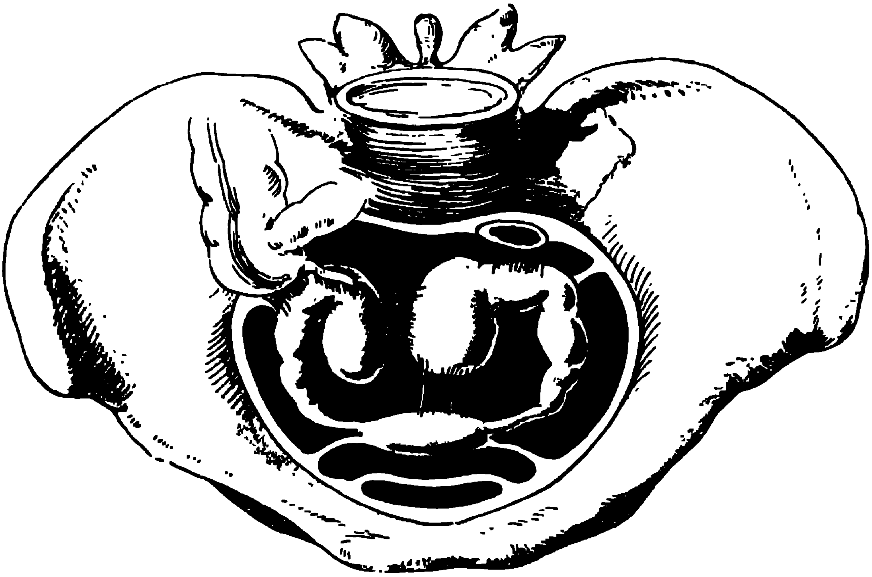

FIG. 196.—TUBO-OVARIAN INFLAMMATORY SWELLINGS (Martin). Representing a more advanced stage than fig. 195. The vermiform appendix is adherent to the right tube. Both tubes are sealed and dilated; adhesions are seen to the other tube, the rectum and the uterus.

The definite recognition of suppuration in these cases is often a matter of great difficulty. Pointing can rarely be recognised except when it involves the rectum ; there it may sometimes be detected by the finger high up in the anterior wall, by the formation of a soft, highly sensitive spot upon the effusion. As a rule it is unsuspected until a discharge of pus reveals its occurrence. Recurrence of acute attacks with pain and fever, even if no rigor occurs, is strongly suggestive of suppuration ; densely hard, fixed swellings, with much surrounding induration, usually contain a focus of pus, albeit often a small one. A rapid rise in leucocytosis during an acute attack indicates pus, but in chronic cases this sign is often absent.

In all chronic cases the condition of the uterus must not be overlooked ; frequently laceration and erosion of the lips of the cervix will be found, and frequently also the body of the uterus is enlarged and tender. These conditions indicate the presence of a chronic endometritis, which was probably originally septic, and may still be a focus of infection from which the tubal or ovarian inflammation may from time to time be reinforced. In such cases the uterus requires treatment as well as the more deeply seated inflammation.

**Cellulitic Effusions.**—In the initial stages of an attack of acute cellulitis the general symptoms are those of septic poisoning, and no localising signs can be made out either on abdominal or pelvic examination. In two or three days the characteristic pelvic effusion appears.

A *cellulitic* exudation in the early stages forms a lateral pelvic swelling, ill-defined in outline, firm in consistence, non-tender to touch, and only slightly movable. At this stage the uterus is not as a rule displaced to the opposite side. A deep laceration of the cervix will commonly be found upon the same side as the swelling, often extending into the vaginal roof. In an advanced case the effusion may surround the cervix and appear to fill the pelvis completely. It then flattens the fornices, immobilises the cervix, and obscures the position and outline of the uterine body and the uterine adnexa. Its consistence is densely hard and unyielding. Rectal examination gives a fuller impression of its extent than vaginal examination, and may also show that the effusion has passed into the peri-rectal cellular tissue, forming an annular or horseshoe-shaped exudation around the bowel. While the effusion is confined to the pelvis there is, as a rule, no abdominal distension or tenderness. On bimanual examination, the presence of an extensive, dense mass of effusion, filling the pelvis more or less completely, can now be made out, but detailed examination of the organs involved is impossible. Upwards, the effusion may pass the pelvic brim and appear on the anterior abdominal wall in the form of an area of dense, dead resistance; this usually occurs at one side only, above the inner half of Poupart's ligament, but often it crosses the middle line so as to partially affect the other side. The swelling appears to be incorporated with the abdominal parietes and to form a part of it; it is tender to the touch owing to involvement of the sensitive parietal peritoneum. Sometimes the effusion may be felt in the iliac fossa, i.e. deeply, above the outer half of Poupart's ligament. There is as a rule no general abdominal tenderness in these cases. The necessity of watching for the appearance of effusions in the peri-renal region and the buttock, in cases of pelvic cellulitis, must be borne in mind.

The presence of suppuration can only be determined by 'pointing.' This is to be expected most frequently above the inner half of Poupart's ligament; softening of the swelling, and œdema or redness of the skin, with increased tenderness, are the most important signs. Pointing may also be detected *per rectum* or *per vaginam*. In cases of doubt the exploring needle may be used.

**Peritonitic Effusions.**—In the initial stages of an acute pelvic peritonitis the patient complains of severe abdominal pain; the lower abdomen is distended and very sensitive to pressure, and the patient may often find relief when lying on her back from drawing up the knees. These signs may subside in two or three days, and if the effusion is but a small one the abdominal swelling and tenderness may completely disappear. If the effusion is a large one abdominal signs almost always persist. A soft, tender, somewhat ill-defined swelling, which is subresonant on percussion, is formed in the hypogastric region, and is usually mesial in position, extending fairly equally upon each side of the middle line. This hypogastric swelling mainly consists of the omentum, matted coils of bowel, and other structures which form the roof of the effusion, and shut it off from the abdomen proper.

On vaginal examination a peritonitic effusion forms in most cases a soft, highly sensitive, mesial, pelvic swelling behind the cervix, which displaces the uterus bodily forwards towards the pubes. When of large size it causes the posterior fornix to bulge into the vagina, and may greatly increase the depth of the pouch of Douglas, and attenuate the cellular tissue lying between the peritoneum and the vaginal wall. The lateral fornices usually show some induration and tenderness, but the distension of the pouch of Douglas is the characteristic feature, and when large it prevents detailed examination of the tubes and ovaries from being made. Rectal examination reveals the extent and consistence of the effusion more fully than vaginal examination.

The bimanual examination must be made gently to avoid the risk of breaking through the limiting protective adhesions; it is chiefly useful in determining the position of the body of the uterus.

In process of absorption the swelling recedes, becomes firmer and better defined in outline, and appears distinctly adherent to the back of the uterus. As resolution proceeds a thickened or dilated Fallopian tube may become manifest, thus revealing the focus of infection. When a pelvic peritonitic effusion suppurates it increases rapidly in size, chiefly in a downward direction, so that the floor of the pouch of Douglas descends, the posterior vaginal wall bulges in its upper portion, and the swelling can be felt *per rectum* to have made its way downwards in the recto-vaginal septum. The tension of the swelling is increased, but not necessarily its tenderness.

**Differential Diagnosis of Pelvic Inflammatory Swellings.**—In the acute stages the differentiation of pelvic inflammatory swellings from one another is not a matter of great practical importance, for all are as a rule to be treated by palliative methods until suppuration occurs. In chronic cases a detailed diagnosis of the parts affected should, however, be made.

Of the three varieties of inflammatory swelling described above, the tubo-ovarian swelling is by far the commonest. Chronic cellulitic deposits are very rare, as the experience gained by the operative treatment of cases of pelvic inflammation has clearly shown. Chronic peritonitic effusions, small in extent and often multiple, are not uncommonly found in association with inflamed tubes and ovaries; they hardly ever occur alone, and their importance is quite secondary to the changes in the adnexa. As has been already mentioned, the commonest result of pelvic peritonitis is the formation of adhesions, leading subsequently to displacement and loss of mobility of the uterus and its appendages.

When a definite inflammatory lump is found the condition is either a chronic salpingo-oöphoritis, or a cellulitic deposit. When the swelling is large enough to extend upwards above the pelvic brim, a cellulitic deposit will be found to be incorporated with the deep layers of the abdominal wall, dull on percussion, and hard and resistant in consistence; a tubo-ovarian swelling lies deeper, and feels free from the abdominal wall, from which, indeed, it is separated by a layer of matted coils of bowel which give a subresonant note on percussion, and render the consistence of the swelling, as felt from above, elastic. Tubo-ovarian swellings of this large size are often found to include a small ovarian cyst which has become infected from the Fallopian tube, and to which the bulk of the swelling is largely due. There are no physical signs by which a large pyosalpinx can be distinguished from an infected ovarian cyst. A small cellulitic deposit confined to the pelvis usually occupies the base of the broad ligament on one or both sides; it is densely hard in consistence and only slightly sensitive to touch. Small tubo-ovarian swellings, on the other hand, are posterior or postero-lateral in position, of more elastic consistence, and are, as a rule, very sensitive when touched; they also give rise to pain when the cervix is moved forward by the finger in the vagina. Often the characteristic outline of a convoluted and thickened tube can be made out in some part of the swelling.

Confusion sometimes arises from the presence of an *inflamed* and *adherent subperitoneal fibroid* attached to the posterior wall of the uterus. Usually it can be distinguished by the closeness of its relation to the uterus. Although a tubo-ovarian swelling is often closely adherent to the back of the uterus, a sulcus between them can usually be felt on vaginal or rectal palpation, which indicates the line of cleavage. In the case of the inflamed fibroid the swelling appears to be completely incorporated with the uterus.

Under anæsthesia, it may be possible in the case of the fibroid to recognise the tubes and ovaries in their normal position.

A cellulitic deposit in the inner part of the broad ligament may appear to be continuous with and to form a part of the uterus, and accordingly it closely resembles a fibroid in its general relations, as also in its consistence. Well-marked reduction in size of a cellulitic deposit can usually be obtained by a course of palliative treatment, and the effect of treatment of this kind may accordingly become an important diagnostic indication. The frequent absence both of fever and of constitutional symptoms in cases of chronic pelvic inflammation has been repeatedly referred to.

## TREATMENT OF PELVIC INFLAMMATION

**Acute Cases.**—All acute cases, whether in the initial stage or during a recurrence, are to be treated in the first place by expectant or palliative measures, independently of the position of the inflammatory lesion. When, however, in such cases there is evidence of diffused peritonitis or of the formation of pus, the treatment necessarily becomes surgical.

During the stage of fever, severe pain, and tenderness, all local interference should as far as possible be avoided, the patient being kept in bed, the diet limited to fluids, the bowels kept open, and simple measures for the relief of pain adopted, such as the application of hot fomentations to the abdomen. In cases of cellulitis this stage may last for several weeks, before resolution or suppuration occurs; in other conditions it usually lasts but a few days. When in an acute case the pain and fever have subsided, absorption of the effusion may be assisted by the use of hot vaginal douches, and glycerine or glycerine-ichthyol vaginal tampons (see p. 615). In all prolonged cases, whether accompanied by much fever or not, a careful watch should be kept for local signs of suppuration, the importance of rectal examination for this purpose being borne in mind.

**Chronic Cases.**—In the great majority of *chronic* cases an inflammatory focus will be found in the uterine adnexa of one or both sides. In such cases it is often a matter of some difficulty to decide whether medical or surgical treatment will give the patient the best chance of recovery. Generally speaking it may be said that medical treatment may be preferred when there has been only a single acute attack, when the tubo-ovarian enlargement is not great, or when there is no evidence of suppuration. Generally speaking, it may also be said that surgical treatment is indicated when there have been repeated acute attacks, when the tube is distinctly dilated, or when there is evidence of suppuration: repeated acute recurrences generally signify the presence of an imperfectly isolated collection of pus.

*Medical or palliative treatment* may often with advantage be preceded by curetting the uterus, when the signs of chronic endometritis are present. This operation not only removes an infected endometrium but allows of the disinfection of the uterine cavity by the application of strong antiseptics (see p. 574). This may be followed by a course of local treatment during which the patient should be confined to bed. Sexual intercourse, and the use of alcohol, must be forbidden during the treatment. Attention should be paid to the condition of the alimentary canal; anæmia, when present, should be energetically treated with suitable preparations of iron, or of hæmoglobin and bone marrow. The local measures consist of vaginal douching, hot hip baths, and medicated vaginal tampons and pessaries, of which the basis is usually glycerine and the adjuvant ichthyol. The *modus operandi* of vaginal medication such as this will be described in another place (see p. 615). Hot-air or electric-light baths applied to the whole of the trunk and limbs also promote the absorption of inflammatory exudates and accordingly form useful accessories. Drugs are of little use, but small doses of mercury and iodide of potassium sometimes appear to do good even in cases not obviously specific. The value of vaccine treatment in cases where the infecting organism can be isolated must not be forgotten. Courses of treatment of ten to fourteen days' duration may be repeated at intervals, as long as there is evidence of progressive improvement in the local and general conditions.

Certain watering-places are of special benefit in cases of tubo-ovarian inflammation. The more important are: in this country, Woodhall; in Germany, Ems and Kissingen; in Austria, Marienbad; in Italy, Salzo-Maggiore. The course of treatment usually lasts from three to four weeks, and the details should be carried out under local medical supervision. Repeated visits to these places are usually required, and there is no doubt that great improvement in general health and marked relief of local symptoms may be thus obtained in chronic non-suppurative cases. Any evidence of local suppuration contra-indicates palliative treatment absolutely.

It is clear that palliative treatment, to be successful, must be prolonged, and from its nature it is beyond the reach of the poorer classes. Accordingly social conditions often form a factor of importance in deciding between palliative and surgical treatment.

*Surgical Treatment:* (*a*) *Suppurative Cases.*—Collections of pus, wherever they may be formed, must be evacuated as soon as they are recognised. Peritonitic and cellulitic abscesses may be opened and drained without any radical procedure being required. The former are most conveniently reached, as a rule, through the posterior vaginal fornix, by the procedure known as *posterior colpotomy* (see p. 599). The latter usually point above Poupart's ligament, and are to be opened there by Hilton's method; when the pus has been reached, the finger should be passed into the cavity for exploration, and any septa felt may then be broken down so that free drainage may be obtained. In some cases it may be possible and advisable to make a counter-opening into the vagina, to allow of the cavity being irrigated thoroughly from above. Large rubber drainage tubes are then introduced, and the case treated on ordinary surgical lines.

An *acute pyosalpinx* attended with fever and with abdominal pain and distension should also, if possible, be evacuated and drained by posterior colpotomy. In such cases the pus is certainly infective, and fouling of the general peritoneal cavity is difficult to avoid completely when the operation is performed by the abdominal route. The disadvantage of the vaginal operation is that secondary peritonitic or ovarian abscesses may remain undetected; when therefore the operation fails to give complete relief, a fuller exploration from above must be undertaken without delay. Dilated tubes drained vaginally may entirely close without any further operation being required, but when other inflammatory foci, not necessarily suppurative, remain, a cure cannot be obtained.

*Chronic pyosalpinx*, whether unilateral or bilateral, is best dealt with by extirpation of the affected tubes by the abdominal route. The ovaries are necessarily infected as well, and the uterus is probably in similar case. When the disease is bilateral a radical operation including complete removal of the tubes and ovaries, and of the uterus by supra-vaginal or total hysterectomy, is therefore the best operation to perform. The removal of the uterus does not appreciably increase the severity of the operation, and inasmuch as this organ is functionless after removal of the ovaries, its ablation does not produce any ill-effect upon the future health of the patient.

(*b*) *Non-suppurative Cases*.—When an operation is decided upon in these cases radical procedures should, if possible, be avoided. The ovary is not necessarily infected, and should be carefully examined and inspected after the abdomen has been opened, to see if it cannot be wholly or partially conserved upon one side or the other. It may not be necessary to remove both tubes in these cases, and a sealed but only slightly thickened tube may be restored to functional competence by *salpingostomy* (see p. 547). Conservative procedures are clearly to be preferred in young women, whenever the local conditions warrant an attempt being made to save the damaged organs.

Inasmuch as the clinical recognition of the presence of pus is so difficult, it is necessary before operating to secure the patient's consent to whatever procedure the operator may subsequently find it desirable to adopt.

## GONORRHŒAL INFECTION OF THE FEMALE GENITAL TRACT

The frequent occurrence of this form of infection in women was first recognised and insisted upon by Noeggerath of New York in 1872. Exact study of the lesions caused by gonorrhœa in women has been since made practicable through the discovery, in 1879 by Neisser, of the specific organism, the gonococcus.

This organism is a diplococcus, each half being discoid in shape; the apposed surfaces are nearly flat and are separated by a distinct interval. The diplococcus is of large size, and multiplies by fusion so as to form clusters, not chains. The organisms penetrate the cells, and are commonly found in the interior of leucocytes and epithelial cells. They possess a special staining reaction, for though easily stained by aniline dyes they are decolourised completely by absolute alcohol (Gram's method). Other diplococci sometimes occur in the urinary tract, which closely resemble gonococci, and which can only be distinguished from them by culture methods, but for practical purposes the staining test is regarded as adequate.

Owing to their power of cell penetration, gonococci can infect an undamaged mucous surface, but skin is impervious to them. They cause suppuration locally, and tissues attacked by them become readily infected by other bacteria, such as the pyogenic cocci, and the bacillus coli. In this way a secondary infection is set up which may persist long after the gonococcus itself has disappeared. Owing to the power which these organisms possess of penetrating the bodies of the affected cells, gonococcal infection is unusually resistant to local treatment.

Gonorrhœal infection spreads mainly by continuity of mucous surfaces, and in the female genital canal it may ascend from the vulva through the vagina, cervix, uterus and Fallopian tube to the peritoneum. There is no marked tendency to lymphatic dissemination except in the case of secondary infections. Occasionally the gonococci enter, and multiply in, the blood giving rise to pyæmic effusions (usually serous) into joint cavities and tendon sheaths, and sometimes producing a virulent form of ulcerative endocarditis.

When occurring in the genital tract gonorrhœa is usually due to infection during sexual intercourse with semen containing the specific organism; but in children gonorrhœal vulvitis may occur from local infection by fingers, or clothing. In this way one child may infect others sleeping in the same bed, or using the same towels.

**Clinical Features.**—The incubation period is about the same as in the other sex, viz. three to seven days, and the disease usually begins as a subacute *vulvitis*; not infrequently, however, in adults this lesion is of such a slight and transient nature as almost to escape recognition. But though the epithelium of the vulva itself is not favourable for the development of gonococci, the infection readily spreads thence in two directions, viz. into the *urethra* and into the ducts of *Bartholin's gland*. Accordingly gonorrhœal vulvitis almost always leads to *urethritis*, and, though somewhat less frequently, to inflammation of the gland and duct of Bartholin. In these situations the inflammatory process persists long after the transient vulvitis has cleared up. Around the urinary meatus and the apertures of Bartholin's ducts, an area of diffused or punctate redness is often seen which is characteristic of chronic infection of these canals. Those around Bartholin's duct are so far characteristic of the disease that they were called by Sänger the 'gonorrhœal macula.' Similar areas of redness sometimes persist upon the edges of the hymen or the carunculae myrtiformes. The presence of a thin, turbid urethral discharge can often be demonstrated by pressure along the floor of the urethra from behind forwards; in the same way, by pinching up the posterior part of the labium majus, the discharge may be seen to exude from the Bartholin's ducts at the sides of the hymen. Sometimes tenderness and thickening of the deeply placed gland of Bartholin will be found without discharge. Gonorrhœal urethritis shows little tendency to ascend to the bladder or the upper urinary tract; the short straight canal drains easily and is freely flushed by urine when the bladder is evacuated. A periurethral abscess sometimes forms, but stricture, though known, is extremely rare in the female. By extension of the inflammatory process or by blocking of the duct, infected Bartholin's ducts and glands may at any time result in the formation of a labial abscess.

Gonorrhœal *vaginitis* is seldom seen in an acute form, and tends to disappear rapidly except in the fornices, where it is often kept up by discharge from the cervix. The stratification of its epithelium, and the absence of glands, no doubt explain the comparative immunity of the vagina. Occasionally, however, a severe case comes under observation in the early stages of the infection. It is probable that the vagina is but rarely the seat of primary infection; in some instances it becomes attacked by upward spread of the disease from the vulva, and in others by downward spread from the cervix.

The *cervix* is one of the commonest seats of gonorrhœal infection in the female, and in many cases it is the original site of infection from coitus. The cervical endometrium offers a favourable nidus for the organism, for its arrangement in folds favours the persistence of the disease and renders local treatment difficult. An acute stage is seldom observed, but in its chronic aspects cervical gonorrhœa forms one of the commonest conditions seen in gynæcological out-patient cliniques. There is then an abundant, thick, yellow, tenacious, purulent discharge from the cervix, but the amount of pus present is subject to great variation. There is commonly a ring of redness or of erosion around the external os, and the mucous membrane of the vaginal fornices is often inflamed. The plug of thick, yellow, muco-pus protruding from the cervix forms a characteristic feature. In this form cervical gonorrhœa may persist for long periods, and the organisms may be found, on careful search being made in the discharge or in scrapings of mucosa from the canal, several years after the primary infection. The infection in its chronic form shows little tendency to spread above the level of the os internum, and accordingly cervical gonorrhœa may exist for prolonged periods without resulting in infection of the adnexa, and ultimate cure of the condition, followed by pregnancy, may occur. Slight degrees of chronic infection of the endometrium escape recognition when the cervix is also involved, but in cases in which gonorrhœal infection ultimately reaches the adnexa, it is highly probable that the uterine cavity is also affected. In its acute form the infection may, however, rapidly spread to the body of the uterus, and large quantities of purulent discharge are then seen much thinner in consistence, and much more abundant than when the cervix alone is attacked. An *acute metritis* may then result from the infection (see p. 194).

The *Fallopian tubes* and *ovaries* are seldom attacked in the early stages of gonorrhœal infection. Nevertheless an acute infection sometimes rapidly ascends the genital tract, reaching the tubes and pelvic peritoneum in an acute form. More commonly the spread is slow and deliberate; even after it has reached the uterus the tubes may escape for a long time, although there is considerable risk of their ultimately becoming involved. The results of tubal infection have been described already; there is little to distinguish gonorrhœal from other forms of salpingitis except the discovery of the specific organism.

The *rectum* is not uncommonly infected in women, either by contact of vaginal discharges with the anal mucous membrane, or by the passage of the enema tube. In making a rectal examination in cases of gonorrhœa great care should be exercised to avoid introducing infection by the finger.

The *symptoms* met with in gonorrhœal infection are mainly those of the lesion which is, for the time, predominant. When the vulva is primarily affected, the initial symptoms are pain and a sensation of heat in the parts, swelling of the labia, yellow discharge and, as the urethra becomes involved, scalding pain on micturition with frequency (see p. 492). In a few days these symptoms usually disappear, with the exception of the discharge, which is persistent; in its chronic form urethritis does not cause pain on micturition. Cervical gonorrhœa, in the chronic form usually met with, causes few symptoms except discharge; for this reason it is commonly neglected at first by those patients who do not attach much importance to the presence of a discharge. Acute infection of the endometrium of the uterine body leads to serious symptoms of fever, sometimes rigors, and acute abdominal pain (see p. 423). Chronic infection of the endometrium is often indicated by the supervention of menorrhagia and dysmenorrhœa in a case of gonorrhœa of some weeks' or months' duration; these symptoms are not met with while the disease is limited to the parts below the internal os; their appearance is therefore important as being, in many cases, the first indication of upward spread of the disease. When the infection first attacks the tubes acute symptoms nearly always occur; there is an attack of severe pelvic pain, with fever and perhaps abdominal distension. The attack generally subsides in a few days, and probably indicates the occurrence of a limited pelvic peritonitis around the fimbriated end, set up by escape of infective material through the unclosed abdominal ostium. Recovery from this attack is generally incomplete, and the patient may remain more or less invalided by abdominal pain, aggravated by menstruation, by exertion, and by coitus. Repeated recurrence of the attacks of acute pain and fever may occur as a pyosalpinx or an ovarian abscess develops. Sometimes adnexa attacked in a case of gonorrhœa remain quiescent after the first acute outbreak, without recurrence of acute symptoms or local signs of suppuration, but whether the damaged tubes are ever functionally restored is doubtful. The symptoms associated with the formation of an ovarian abscess are similar to those met with in cases of pyosalpinx.

The *diagnosis* of gonorrhœal infection in the case of all lesions ultimately depends upon the detection of the gonococcus. In cases of recent infection the vulvo-vaginal purulent secretion usually contains the organism in large numbers; in chronic cases the pus from the urethra or the cervix is most likely to contain it. A smear preparation should be made, which may be first stained in Löffler's methylene blue and then treated by Gram's method, when the diplococci will be decolourised. This serves to distinguish them from nearly all other kinds of diplococci, but precise bacteriological proof requires culture reactions also. The stain is sufficiently characteristic for clinical purposes.

In the case of cervical gonorrhœa the best way to find the organism is to harden a mass of the thick jelly-like muco-pus and cut it in sections, which can be stained in the manner just described. If the organisms are scanty they are more likely to be detected in this way than by a smear preparation.

In the case of the internal lesions, their gonorrhœal origin cannot be demonstrated until the opportunity arises to examine the pus from the abscess or the infected tissues themselves. But in chronic cases of long standing the gonococci often cannot be found in the contents of a pyosalpinx; as has been mentioned already, their place is then often taken by other organisms which have followed in the track of the original infective organisms (secondary infection). But the recognition by physical examination of tubes and ovaries enlarged by inflammation or by abscess formation in the case of a woman known to have been the subject of gonorrhœal infection, is sufficient clinical ground for diagnosis.

**Local Treatment.** — Gonorrhœal *vulvitis* in the acute stage should be treated by frequently bathing the parts with a mild antiseptic such as boric acid (1 in 40) or lysol (ʒi to O ii); hot hip baths and boracic fomentations applied to the vulva are also useful. Syringing or douching should be avoided so as not to carry infective material into the vaginal canal. In the case of children boric acid fomentations and bathing, with scrupulous attention to cleanliness, are sufficient. When the acute stage has passed, the application of weak solutions of argyrol or protargol (5 to 10 per cent.) will be found useful. Chronic urethritis may be treated by irrigating the urethral canal with the same solution; it usually yields readily to treatment. Infection of Bartholin's gland and duct is amenable only to treatment by incision, for the narrowness of the duct renders efficient drainage impracticable.

Gonorrhœal *vaginitis* is seldom seen in an acute form for the reasons already mentioned. It is, however, sometimes encountered in a subacute or acute stage at a period preceding the spread of the infection to the cervical endometrium. It is then desirable to treat it energetically with the object of cutting short the infection and so preventing its extension. This may be attempted by thoroughly disinfecting the vaginal walls under anæsthesia with a strong solution of biniodide of mercury, rubbed energetically over the vaginal surface with swabs until the superficial epithelium has been removed and oozing occurs. This must be done thoroughly to be effectual. Then the vagina is loosely packed with iodoform gauze, and after twenty-four hours this is removed and douching is begun. If successful this method may cure the vaginitis in three or four days. When chronic, vaginitis is best treated by swabbing the vaginal walls through a speculum with a solution of nitrate of silver (10 grs. to 20 grs. to 1 ounce).

*Cervical gonorrhœa* is very intractable. In the acute stage local treatment is not advisable. In the chronic stages the difficulties to be encountered in local treatment are the small size of the canal, the folded arrangement of the mucous membrane, and the great depth of the glands; the viscid character of the discharge makes its removal by mechanical means still more difficult. In applying local treatment it is important to avoid passing the sound or any other instrument through the internal os into the uterus, as this will almost certainly cause infection of the endometrium. It is best to swab out the cervical canal with an alkaline solution which dissolves the thick mucus (liquor potassae diluted to one in three answers the purpose very well), and then to apply one of the following solutions freely on a probe thickly covered with cotton-wool: peroxide of hydrogen, forty vols.; solution of nitrate of silver, twenty grains to an ounce; argyrol or protargol solution, 40 per cent. In addition a non-irritating antiseptic douche should be used to cleanse the vaginal walls and prevent accumulation of discharge in the vaginal vault; weak solutions of permanganate of potash or of iodine are suitable for this purpose. The applications to the cervical canal should be made two or three times a week except during menstruation. The improvement thus obtained is often slow, and in some cases no benefit at all can be observed. Curetting the cervical canal may be tried, but the results are also disappointing owing to the practical impossibility of removing the whole of the mucosa and its glands. Amputation of the cervix has in some cases been practised to eradicate the disease, but this should not be done until a trial has been given to the vaccine treatment mentioned below.

*Uterine* gonorrhœa is a grave condition both in its acute and chronic stages. Little can be done locally except to irrigate freely, and to provide for drainage, as far as possible, through the cervix by means of an antiseptic gauze wick passed into the uterus and changed daily. Rapid extension to the tubes usually occurs and the importance of the uterine condition becomes overshadowed by these lesions.

Gonorrhœal infection of the *uterine adnexa* and the *pelvic peritoneum* is treated in the same manner as other varieties of inflammation of these parts (see p. 433).

**General Treatment.**—Certain general measures are of importance in supplementing the local treatment just described, no matter what the position of the predominant lesion may be. Coitus should be avoided, cigarette smoking and the use of alcohol forbidden, the bowels kept acting freely, and when the urethra and vulva are involved, diluent drinks such as barley water or 'imperial drink' taken freely by the patient. Drugs are of little use; the balsamic remedies such as copaiba and cubebs usually exhibited to patients of the other sex, are of no importance owing to the trivial character of the urethritis in the female. In all chronic and resistant lesions the effect of gonorrhœal vaccine may be tried, and as this organism breeds true it is unnecessary to prepare the vaccine from the discharge itself. Large doses may be given, for instance, 100 million rising gradually to 500 million organisms injected once a week under the skin of the arm or thigh. Cases of cervical gonorrhœa which have resisted all other methods may sometimes be cured by this means. It is, however, desirable to demonstrate the presence of the diplococcus in the discharge before commencing this treatment.

At all stages the patient should be warned of the infectious nature of the discharges both to herself and others; particular care being exercised to avoid carrying infection to the eyes and the rectum.

## TUBERCULOUS DISEASE OF THE FEMALE GENITAL TRACT

The occurrence of tuberculous lesions in the female genital organs is by no means uncommon; post-mortem observations show that in about 20 per cent. of cases of women dead of tuberculous disease the genital organs are found to be affected. In the great majority of these cases the lungs or the alimentary canal were the seat of the primary disease, the genital organs being secondarily affected. Considerable uncertainty still exists as to what proportion of cases can be strictly regarded as primary, for only by an exhaustive examination of the body after death can this question be definitely determined. Clinically speaking, however, in about 10 per cent. of cases of genital tuberculosis the other organs of the body have been found to be free from the disease, and these may be regarded as primary. In primary cases such as these the usual channel of infection is the blood or the lymph stream, the organisms entering through the lungs or the alimentary canal. The possibility of the occurrence of primary infection by tuberculous semen (tuberculous epididymitis) during coitus has been much discussed and cannot be denied, but actual proof of its occurrence has not hitherto been furnished.

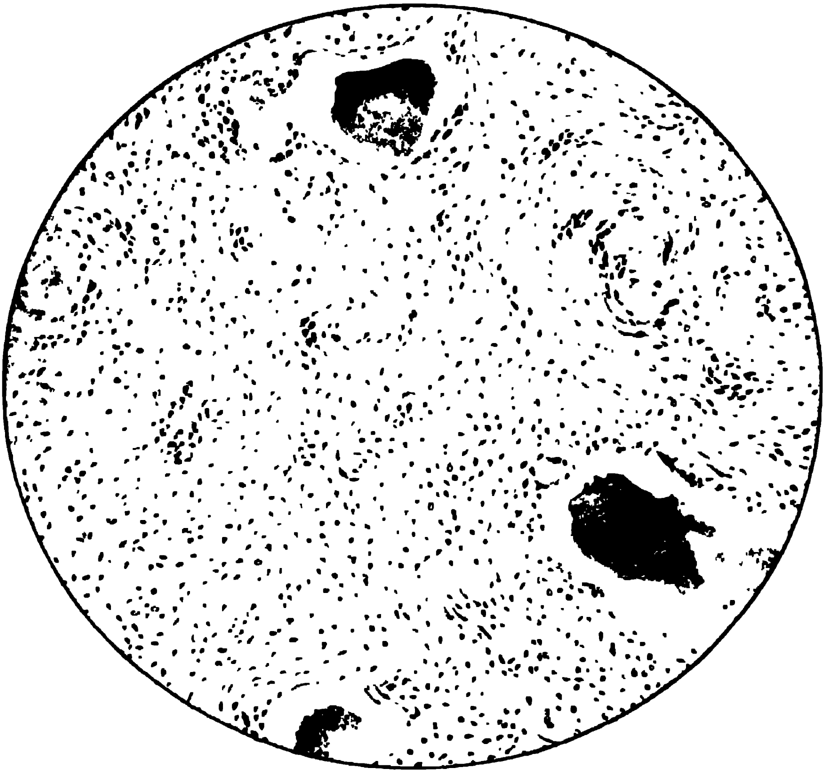

FIG. 197.—CHRONIC TUBERCULOUS SALPINGITIS. The section shows a portion of the thickened wall of the tube, in which three large giant cells are seen.

**Fallopian Tubes and Ovaries.**—In about 50 per cent. of all cases of genital tubercle the Fallopian tubes are affected, but in only a small proportion is the disease primary. Both tubes are nearly always affected, and as a rule the disease begins in the mucous membrane. As the lesion advances the musculature and the peritoneal coat become affected also. In some cases the tube is found thickened, tortuous, firmly embedded in adhesions, and often with small areas of caseation in the mucosa or in the thickened wall. In other cases dilatation of the tube occurs giving rise to a tuberculous pyosalpinx; when of small size this often has a somewhat cylindrical shape resembling that of a banana or a sausage (fig. 192); at times, however, a tuberculous pyosalpinx attains a large size and then assumes the common retort shape as is seen in fig. 191. The peritoneal surface of the tube is commonly studded with tubercles and usually densely adherent; the adjacent pelvic peritoneum and the adherent coils of intestine will then be found affected with tubercle also. On microscopic examination giant cells, or true giant-cell systems, are readily found in the tube walls (fig. 197).

The liability of the Fallopian tubes to secondary infection through their peritoneal coat when tuberculous disease of the peritoneum is present will be sufficiently obvious; also detached tuberculous material may be carried by peritoneal currents into the tube and find lodgment in the tubal mucosa. When primary, the infection no doubt reaches the tube by the blood stream. From the tube infectious material may be carried into the uterine cavity, and deposits may then be formed at any part of the genital tract below this level; by contiguity the ovaries usually become infected in advanced cases. For these reasons the Fallopian tube is often the starting point of tuberculous disease of the genital organs.

The *ovaries* are less frequently affected than the tubes, and cases of primary infection appear to be almost unknown. They may become secondarily infected from the peritoneum, the intestine, or the Fallopian tube, and both ovaries are, as a rule, involved. Two forms are met with: in one the ovary is studded with miliary tubercles, and embedded in masses of dense adhesions; in the other suppuration has occurred in the substance of the ovary, and recent abscesses of considerable size (fig. 191), or in chronic cases, caseous masses, may be formed. A tuberculous pyosalpinx and a tuberculous ovarian abscess are accordingly often met with in company. It is said that the corpus luteum is especially liable to become the seat of tuberculous deposits.

*Diagnosis.*—There are no characteristic signs or symptoms by which tuberculous disease of the uterine adnexa can be recognised. When the other common causes of inflammation of these organs can be excluded, as may be the case in virgins, tubo-ovarian swellings, especially if bilateral, are very likely to be tuberculous. When tuberculous lesions of the lungs or intestines exist along with inflammation of the tubes and ovaries, there is a probability of the latter disease being also tuberculous in all cases. The physical signs yielded by tuberculous appendages differ in no appreciable degree from those encountered in other varieties of chronically inflamed tubes and ovaries. It follows that precise diagnosis is usually impossible until the diseased organs have been exposed; and further, microscopic examination will frequently reveal tubercle in cases where its existence was not suggested by the naked-eye appearances. The bacilli themselves are rarely found, except in recent deposits, but giant cells and giant-cell systems are numerous and characteristic (fig. 197).

*Treatment.*—Medical treatment of this disease is ineffectual. The surgical rule that tuberculous deposits should be freely removed, whenever practicable, is, of course, applicable to the tubes and ovaries. But the frequency with which extensive tuberculous disease of other parts is also present complicates the question of operation, and often leads to the rejection of surgical interference. When the pelvic lesions are the only ones, or the only apparently active ones, free extirpation of the affected parts is desirable. As a rule the disease is bilateral, and frequently the endometrium has become secondarily affected, therefore an extensive operation in which the uterus and the adnexa of both sides are removed should be practised (see p. 545). When the pelvic disease is found to be complicated by extensive tuberculous peritonitis, the tubes and ovaries should not be removed unless foci of suppuration are present in them; the well-known beneficial effects of laparotomy upon tuberculous peritonitis may be awaited with confidence where pus is not found. It is in all cases difficult to perform a strictly radical operation in tuberculous disease of the adnexa, for areas of infected peritoneum outside these organs will almost necessarily be left behind.

**Uterus.**—The uterus is much less frequently affected than the uterine adnexa; in almost all cases it is secondary to tuberculous salpingitis, the tube being the source of infection.

Tuberculosis may affect the endometrium of the body in a miliary or a suppurative form; in the latter the cervical canal may become blocked, giving rise to tuberculous pyometra, a condition to which the name of 'uterine phthisis' has been applied. In the cervix either the mucosa or the surface of the vaginal portion may be affected. In the latter position tuberculous deposits take either a papillary or an ulcerative form, and run a chronic course. In the majority of cases of cervical tuberculosis there is definite evidence of other pelvic organs being affected, but occasionally the cervix is the only pelvic focus of the disease, and in a few rare cases it appears to have been, strictly speaking, a primary focus.

Tuberculous endometritis can only be diagnosed by microscopic examination of scrapings from the uterus. Inasmuch as the condition is nearly always complicated by tuberculous disease of the tubes, the only treatment likely to be of service is the removal of the uterus and the adnexa of both sides. Cases of chronic endometritis, unexpectedly shown by the microscope to be tuberculous, have been recorded in which a single curetting appears to have cured the condition. Brewis has recorded such a case in a woman of fifty-two.

Tuberculous disease of the vaginal portion of the cervix has to be distinguished from a papillary 'erosion,' and from the early stage of cancer. An appeal to the microscope is desirable in all cases, but the appearances lend some aid in diagnosis. Thus a tuberculous deposit differs from cancer in showing little tendency to bleed, in being less friable, and in yielding a free muco-purulent discharge. The presence of tuberculous lesions in other organs will suggest the possibility of the cervical lesion being also tuberculous. When the tuberculous deposit is confined to the cervix, the other pelvic organs being free, it may be treated by free and repeated cauterisation, or by amputating the cervix well above the level of the disease.

**Vagina and Vulva.**—In these parts of the genital tract tubercle is rarer than in any other, and the proportion of primary cases reaches its minimum. The upper part of the vagina may become infected from the tubes and the uterus or from the rectum. The lower part of the vagina and the vulva usually become involved in advanced cases of tuberculous disease of the urinary tract. About one-half of all the cases occur in children. Owing to the circumstances under which it is met with local treatment is seldom possible. A small number of cases of primary tuberculous deposits in the vulva have been recorded in which excision of the affected parts has been practised. The relationship of tubercle to esthiomène of the vulva will be referred to in another place (see p. 506).

## ACTINOMYCOSIS OF THE FEMALE GENITAL ORGANS

This rare disease, due to the ray fungus (*Streptothrix actinomyces*), has been detected in the ovary, the Fallopian tube, the pelvic cellular tissue, and the labia. It is very doubtful whether in any of the recorded cases the pelvic focus was the primary one. The two commonest sites in which this disease is found as a primary lesion are the intestine, including the vermiform appendix, and the liver. From the rectum or the appendix extension to the tubes may readily occur, and this is in all probability the usual sequence of events.

The disease runs a chronic course, and is attended by local inflammation leading frequently to abscess formation and the production of fistulous communications with the surface of the body, or with one of the hollow viscera. Older lesions tend to cicatrise spontaneously, and dense masses of fibrous tissue may be formed which resemble a solid neoplasm. At the same time the disease in other directions progresses, so that fresh abscesses may form as the old ones become healed.

Pain, fever, wasting, and discharges—either from the vagina, or from artificial openings—characterise the course of the disease. Its clinical features bear a certain resemblance to those of tuberculous disease, for which condition it has been frequently mistaken.

Foci which are amenable to surgical treatment may be extirpated, but the prognosis is unfavourable, inasmuch as the disease continues to advance because complete extirpation is practically impossible.

A certain amount of benefit can be obtained in inoperable cases by irrigating sinuses and fistulae with a weak solution of sulphate of copper, and administering iodide of potassium in large doses by the mouth.

# PART IX

## EXTRA-UTERINE (ECTOPIC) GESTATION

It is now well established that a fertilised ovum may become implanted not only in the uterus, but in the Fallopian tube, or in the ovary; in the two last-named positions the pregnancy is called extra-uterine or ectopic. The implantation of a fertilised ovum upon the peritoneum—*primary peritoneal pregnancy*—has not yet been satisfactorily demonstrated, although a number of supposed instances have been recorded.

### OVARIAN PREGNANCY

It is only within recent years that the occurrence of ovarian pregnancy has been satisfactorily proved, but the number of cases which can be accepted as reliable instances of the condition is now fairly large. There can be no doubt that it is very much less frequent than tubal pregnancy. In most cases the site of implantation appears to have been a Gräafian follicle, which may be entered by spermatozoa through the site of rupture, or possibly by direct penetration of the wall. It is, however, possible that the ovum may be impregnated when lying upon the surface of the ovary after its discharge from the follicle, and may afterwards excavate a bed for itself in the ovarian tissues by its remarkable powers of erosion. Generally, however, the spermatozoa enter a Gräafian follicle, and fertilise an ovum therein which has not been discharged along with the fluid contents of the follicle. In the cells which line the follicle the ovum finds its nidus, and the early stages of development pursue the usual course. Fig. 198 shows the formation of the *gestation sac* or maternal covering of the ovum; this consists simply of the layers of tissue which normally compose the wall of the Gräafian follicle (tunica interna and tunica externa), and it will be seen that the greater part of the ovum is unsupported except by this delicate follicular wall. There appears to be no true decidual formation in the ovary, although large cells have been found by some observers and regarded by them as decidual. In all the authentic cases pregnancy terminated at an early period by rupture, and it seems improbable that this form of gestation can continue for more than a few weeks. Its differential diagnosis by clinical methods from tubal pregnancy is impracticable in the present state of our knowledge, careful examination of the complete specimen, after removal, being required to determine its true nature.

## TUBAL PREGNANCY

The lodgment of a fertilised ovum in the Fallopian tube is not uncommon. The causes of the arrest of the ovum in the tube on its journey to the uterus are probably not pathological, most of the older explanations having been disproved, or abandoned from lack of supporting evidence. It is known, however, that diverticula of the tubal canal are sometimes found running up into the fibro-muscular wall of the tube (p. 32); it is possible therefore that an ovum, either before or after being fertilised, may wander into one of these *impasses* and, being detained there, may become engrafted upon the mucous membrane, which has the same structure as that of the tube proper. And further, the anatomical arrangement of the tubal mucosa is such that the ovum may readily become detained among the complex ramifications of the tubal plicae in the outer portion of the canal (fig. 23). The view that arrest of the ovum in the tube may be due to such morbid conditions as salpingitis, or partial occlusion of the tubal lumen by adhesions, has not received support from morbid anatomy, and must be abandoned. Age and social conditions do not influence its occurrence; it may be met with in a first or in any subsequent pregnancy, and in the latter case it may follow normal-gestation after an interval varying from a few months to many years. Tubal pregnancy is in all probability to be regarded as an accidental occurrence; it is a morbid condition only in the sense of involving both the mother and the ~~ovum~~ in serious risks. Consequently gravid tubes are as a rule healthy at the time of the occurrence

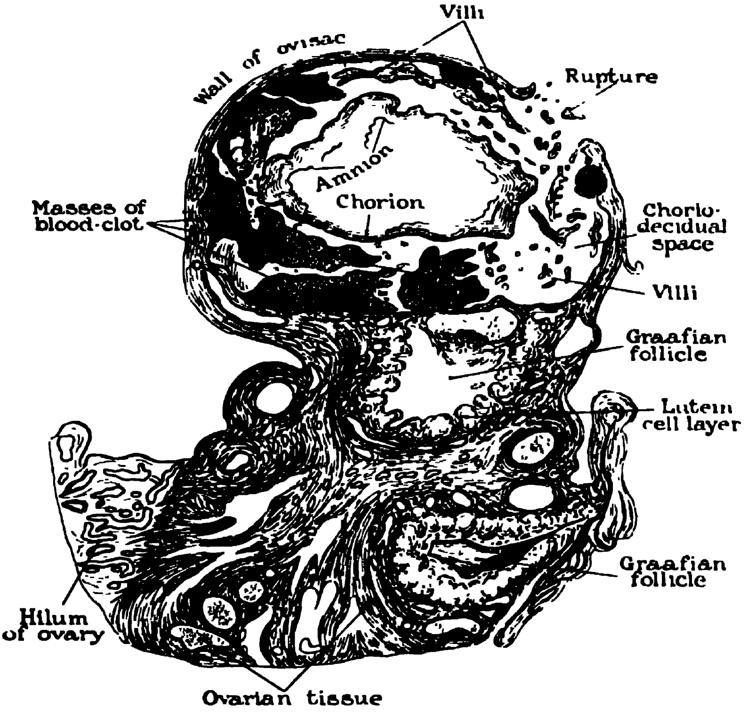

FIG. 198.—OVARIAN PREGNANCY (Van Tussenbrock). The ovum has developed in a Graafian follicle; rupture has occurred on the free surface of the gestation sac.

of gestation (fig. 203); in some cases, however, evidences of chronic salpingitis are found, showing that this condition sometimes precedes the gestation (fig. 202).

**Anatomy.**—Tubal pregnancy gives rise to a series of well-marked changes in the uterus, and in the affected Fallopian tube; the former are uniform and constant, the latter vary with the location of the ovum. The *uterus* always shows a certain amount of enlargement, accompanied with softening of its walls and softening of the cervix; both are recognisable clinically, although the softening of the lips of the external os is not so well marked as in uterine pregnancy. The endometrium is completely converted into a decidual membrane indistinguishable from the decidua vera of normal uterine pregnancy. This change has been spoken of by Webster as the 'decidual reaction' of the uterus. In the affected *tube* the changes are mainly confined to the neighbourhood of the ovum, distant parts showing practically no changes recognisable with the naked eye. The portion of the tube which encloses the ovum is usually called the *gestation sac*.

The fertilised ovum lodges most frequently in the *ampulla* of the tube, more rarely in the *isthmus*, and least frequently of all in the *interstitial* portion. It has recently been shown that, when lodged in the tube, the fertilised ovum buries itself in the maternal tissues very much in the same manner as in uterine pregnancy. The mucous membrane undergoes no preparatory thickening as does the endometrium; penetration of the tissues is easy, and the ovum appears in some cases, if not in all, actually to reach the muscular coat and become completely imbedded in it. The ovum thus develops, for a time at any rate, in a cavity hollowed out of the substance of the tube wall and practically shut off from the tube lumen. This arrangement compensates, to some extent, for the absence of a complete decidual investment, and renders the early lodgment of the ovum more secure. The formation of the embryo and of the embryonic coverings proceeds in the same manner as in uterine pregnancy. At the site of the growing ovum the tube undergoes rapid distension and assumes a somewhat oval form. The wall of the distended portion becomes considerably thinned; this thinning is due in part to the absence of compensatory muscular hypertrophy, such as takes place in the gravid uterus, and in part to the eroding action of the chorion, which penetrates the tissues, and so further thins the wall. No true formation of a decidua occurs in the tube, although it has been demonstrated that clusters of large 'decidual' cells may be found here and there in the mucous membrane of both the affected and the unaffected tube. When the ovum lodges in the ampullary portion the abdominal ostium almost invariably becomes occluded before the end of the second month (eighth week); when the ovum lies in the isthmus or the interstitial portion the abdominal ostium does not close (fig. 203). The condition of the ostium, as will appear later, has an important clinical bearing. A gravid tube is usually found, on opening the abdomen, to have contracted adhesions to surrounding structures; and at spots where the penetrating villi have reached, or nearly reached, the peritoneal coat, thick layers of lymph become deposited, the effect of which is to strengthen the weak spot.

From this account it is obvious that the ability of the Fallopian tube to continue to accommodate the growing ovum is by no means certain; as a matter of fact it fails to do so except in extremely rare instances. It is, however, believed that genuine cases are on record of gestation continuing to term, or nearly to term, in an unruptured Fallopian tube. Failing this event, either the ovum is destroyed, or it escapes from its cramped surroundings and pursues its development under more favourable conditions. The ovum may be destroyed *in situ* by hæmorrhage which converts it into a *tubal mole*; or it may be detached from its base and expelled either through the patent abdominal ostium (*tubal abortion*), or through a rent in the wall of the tube (*tubal rupture*). In some instances rupture occurs without causing complete detachment of the ovum; its existence is not then necessarily terminated, for development may proceed in the freer space thus gained for it.

*The Tubal Mole.*—The mode of formation of a tubal mole is well shown in fig. 199, which represents a transverse section through a gravid Fallopian tube at the site of implantation of the ovum. The lumen of the tube is occupied by an oval mass of blood clot detached completely from the wall; a cavity of irregular shape, representing the amniotic sac, is seen, placed somewhat excentrically in the midst of the blood clot. The effect of the hæmorrhage has clearly been to break up the chorion which at this early period is covered in all parts with villi; many detached villi are seen in section in the blood clot surrounding the ovum; a few are seen still retaining their attachment to the ovum, others are seen to be buried in the tube wall and to be broken off entirely from the ovum. There is no appreciable thinning of the wall of the tube except at the right of the figure, where chorionic villi can be seen to have penetrated nearly as far as the peritoneal investment, thus breaking up the muscular wall of the tube. This spot probably represents the pit in which the ovum was originally imbedded. Remains of the branching plicae of the tubal mucosa are also seen flattened out against the tube wall, which indicate that the ovum has lodged in the ampullary portion of the tube. In fig. 200 are seen the naked-eye appearances of a tubal mole *in situ* laid open by longitudinal section; the tube was removed

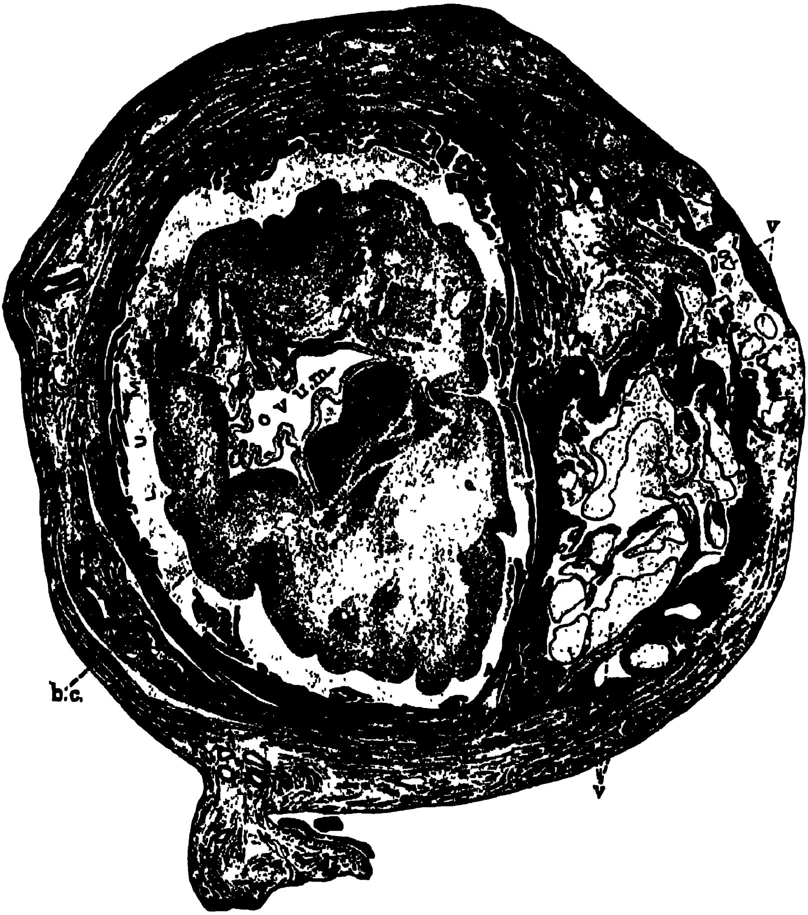

FIG. 199.—SECTION THROUGH A GRAVID FALLOPIAN TUBE, ILLUSTRATING THE FORMATION OF A TUBAL MOLE (Whitridge Williams). *V*, Villi which have penetrated deeply into the wall of the tube, probably indicating the original implantation site; *b.c.*, Blood clot containing chorionic villi seen in section; in the centre of the mass is an irregular space representing the amniotic sac.

on account of hæmorrhage through the unsealed abdominal ostium.

The statement is made by Bland-Sutton that 'a tubal mole is due to blood extravasated from the circulation of the embryo.' This opinion rests solely upon the observation by this author of the occurrence in the tubal mole of nucleated red blood-corpuscles such as are found in the blood of the embryo, but not in that of the adult. In reality all that this observation proves is that there is in the mole an admixture of embryonic blood; but it cannot be

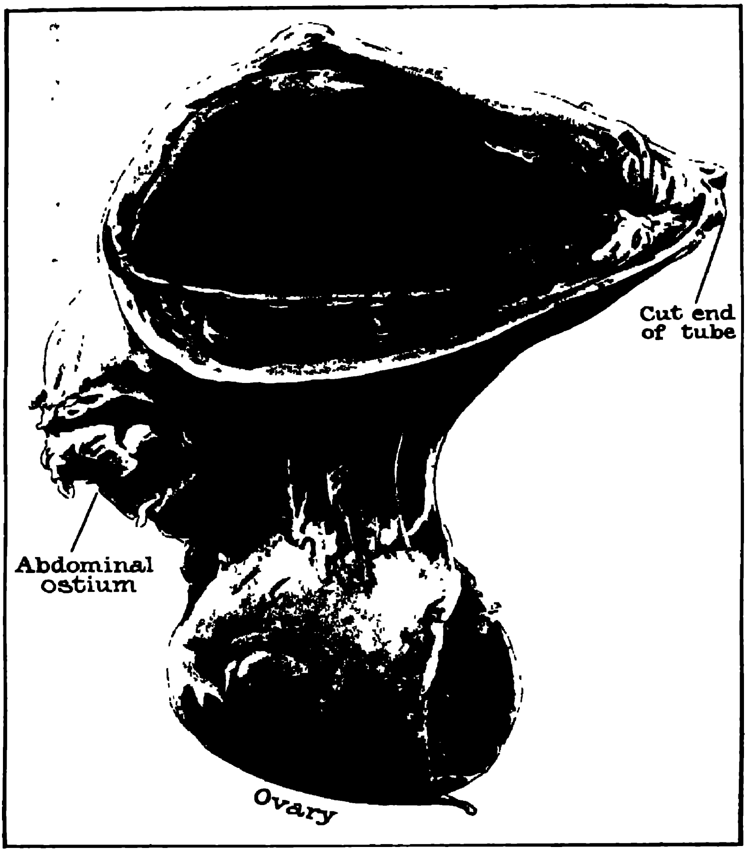

Fig. 200.—Tubal Mole in situ, laid open by longitudinal incision of the Tube (Charing Cross Hospital Museum). The mole occupies the inner half of the ampullary portion of the tube. The abdominal ostium is patent.

supposed that tubal moles, which are much larger and heavier than the embryo, can be formed by extravasation of embryonic blood alone. There is no doubt that they consist almost entirely of maternal blood which has been extravasated from the tube wall among the villi.

~~In tubal pregnancy~~ the frequency with which moles occur is far greater than in the case of uterine pregnancy, probably on account of the greater insecurity of the ovuline attachments in the former. The formation of a mole is frequently accompanied by more or less hæmorrhage through the unsealed abdominal ostium. The ovum is of course destroyed by this process; small moles may perhaps be retained in the tube and gradually disposed of by absorption; larger moles are usually expelled by tubal rupture or abortion. Suppuration of a mole retained in the tube probably only occurs as the result of some form of infection, such as sepsis, gonorrhœa, or bowel infection.

In operating on cases of tubal gestation a mole is frequently found among the blood effused into the peritoneal cavity by rupture or abortion; it exactly resembles a lump of blood clot, and may remain unnoticed unless carefully looked for. Small moles are nearly globular (fig. 203); larger ones are oval in shape, heavier and firmer than simple clotted blood (fig. 200); they often show remains of the amniotic sac on section, and on microscopic examination, after suitable hardening, are found to contain chorionic villi imbedded in clotted blood.

The recognition of chorionic villi under these conditions is a matter of some clinical importance. As shown in fig. 201 some are free, others imbedded in the blood clot. The former are covered by epithelium, definitely recognisable as that of the chorion, since it is composed of two layers—the outer layer consisting of irregularly nucleated plasmodium (the syncytium), the inner layer consisting of a single row of low columnar cells (Langhans's layer). The latter have almost completely lost their epithelium, while the stroma of all the villi has undergone considerable degeneration and appears structureless. ~~The epithelium~~ retains its vitality for a longer period after the destruction of the ovum than the stroma; this difference is due to the fact that the former is normally nourished directly by the maternal blood, with which it is always in contact, while the latter is normally nourished by ~~the blood~~ in ~~the fœtal~~ capillaries. The epithelium can therefore draw nourishment from the effused blood in a mole, and thus survive, while the stroma, being suddenly cut off from its source of nutrition, perishes with the embryo. Owing to survival of the epithelium, villi can be recognised in a mole many weeks after its formation. Around the villi is seen blood clot, in varying degrees of contraction—i.e. with a variable amount of fibrinous network. Sometimes quite fresh-looking villi may be found in a recent tubal mole.

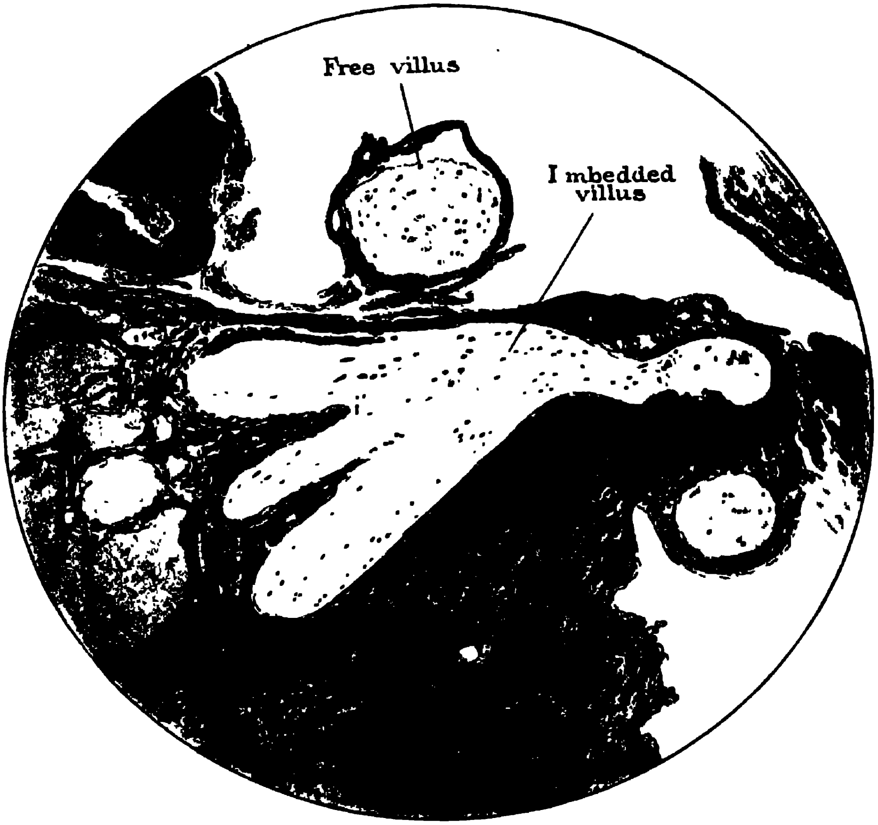

FIG. 201.—CHORIONIC VILLI FROM A TUBAL MOLE. The large imbedded villus is seen to have lost its epithelial covering; its stroma contains very few nuclei. The free villi have preserved their epithelium, which consists of a double row of cells. Syncytial buds in section are seen in the upper part of the figure.

*Tubal abortion* occurs frequently in ampullary pregnancy while the abdominal ostium remains patent—i.e. during the first two months of gestation; it is believed that it occurs almost as commonly as rupture in this variety of tubal pregnancy. In the isthmial and interstitial varieties, however, rupture is much more frequent than abortion; in the latter variety tubal abortion consists in the discharge of the ovum through the uterine ostium into the *uterine* cavity. An aborted tubal ovum, as a rule, has been previously converted into a mole, but this is not always the case. The process of abortion is shown in fig. 202, which shows that the mole has been partly expelled through the dilated abdominal ostium. The main factor in its production is undoubtedly muscular contraction of the unaffected portions of the tube; the process constitutes a miniature labour, consisting of a stage of dilatation followed by a stage of expulsion, which again is succeeded by a stage of retraction. The developmental unity of the uterus and Fallopian tubes no doubt accounts for this physiological analogy. The contractions are perhaps reflexly excited by hæmorrhage into the ovum causing

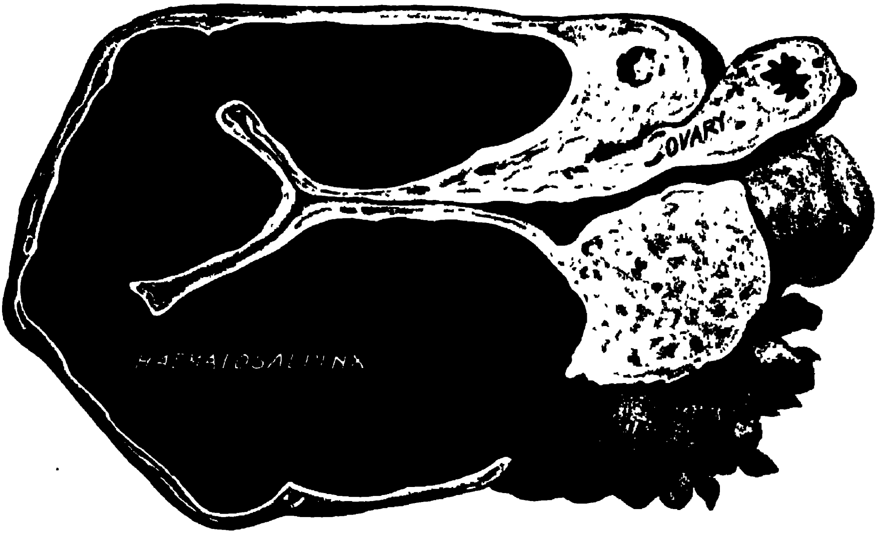

FIG. 202.—TUBAL PREGNANCY, TERMINATING IN ABORTION. The tubal mole is seen partly extended through the abdominal ostium. The tube is convoluted and its walls thickened from chronic salpingitis; its lumen is dilated and full of blood.

sudden distension of the tube. The expulsion of the ovum may be complete or incomplete; in the latter the ovum is detained in the insufficiently dilated abdominal ostium, or a portion of it may remain attached to the original implantation site of the ovum, the bulk of which has been expelled. Here again the analogy with uterine abortion will be obvious. Tubal abortion may be attended by severe internal bleeding, equal in severity to that caused by rupture; its result as regards the ovum is invariably to destroy it. After the expulsion of the ovum the tube usually remains considerably distended with blood (fig. 208), but it is believed that it may rapidly retract and resume its normal shape and calibre, leaving no trace to the naked eye of having been recently gravid. It is impossible to distinguish tubal abortion from tubal rupture by clinical diagnosis.

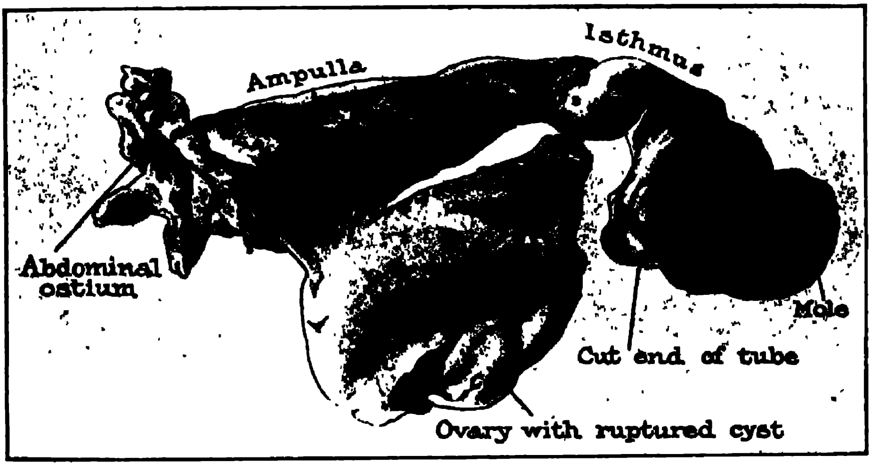

FIG. 203.—TUBAL PREGNANCY OF FOUR TO FIVE WEEKS' DURATION. Rupture has occurred in the isthmial portion of the tube and a small mole has been extruded. The abdominal ostium is patent, and the ampullary portion shows little alteration.

*Tubal Rupture.*—In whatever part of the Fallopian tube the fertilised ovum may be lodged, there is a tendency to the occurrence of spontaneous rupture. In the isthmial and interstitial varieties rupture is apt to occur earlier than in the ampullary variety, owing to the fact that the latter is larger and more distensible than either of the former. Between the eighth and tenth weeks is the commonest time for rupture to occur, but it may be earlier or later than this. The conditions which predispose to rupture have been mentioned —viz. thinning of the tube wall by distension, and the eroding action of the villi. In addition there is probably a determining cause in most instances, such as a sudden increase in size of the ovum from hæmorrhage, or slight increase in vascular tension from some muscular effort on the part of the patient. Occasionally the eroding action of the villi alone will determine spontaneous perforation of the wall of the tube. Occlusion of the abdominal ostium is not an essential factor in the causation of rupture, for this accident frequently occurs without it, even in the ampullary variety. Any part of the wall of the distended portion of the tube may burst.

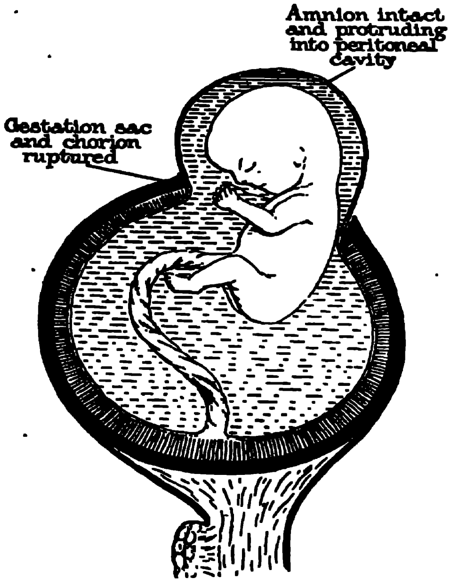
Amnion intact and protruding into peritoneal cavity
Gestation sac and chorion ruptured

FIG. 204.—INTRA-PERITONEAL RUPTURE OF THE TUBE (diagrammatic; after Giles). The chorion has been torn, but the amnion remains intact, the fœtus contained within it; the placental portion of the chorion is uninjured. The fœtus may survive.

The results of rupture, in so far as the life of the ovum is concerned, depend to a great extent upon the position of the rent. If occurring upon the roof or sides of the tube, the rupture will involve the peritoneal covering, and the blood effused will therefore be poured out into the general peritoneal cavity, while the mole may be completely expelled through the rent (fig. 203). If, on the other hand, the tear takes place in the floor of the tube, the peritoneal coat may escape; while the effused blood and the discharged ovum will make their way between the layers of the broad ligament, gradually separating them and burrowing in the connective tissue which this ligament contains (figs. 206 and 207). This form of rupture is very uncommon and occurs mainly in cases of isthmial pregnancy, since the lower wall of this portion of the tube is less completely invested by peritoneum than the ampulla. The former is known as *intra-peritoneal* rupture, the latter as *intra-ligamentary* or *extra-peritoneal* rupture. In both varieties the ovum is, as a rule, destroyed by previous hæmorrhage and converted into a mole. Apart from hæmorrhage, this result also inevitably follows (*a*) if the amnion is ruptured, or (*b*) if the placental portion of the chorion is lacerated or detached by the rupture (figs. 205 and 207). Occasionally, however, the ovum may continue its development, and in such cases it is observed that the amnion has remained intact, and that the placental chorion was so situated as to escape injury from the rupture (figs. 204

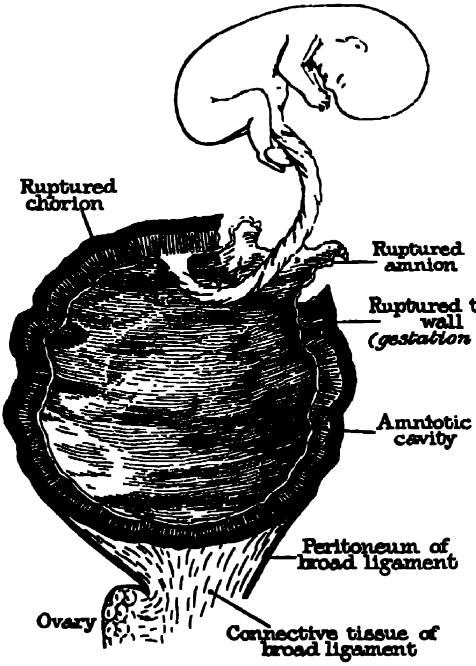
Ruptured chorion
Ruptured amnion
Ruptured tube wall (gestation sac)
Amniotic cavity
Peritoneum of broad ligament
Ovary
Connective tissue of broad ligament

FIG. 205.—INTRA-PERITONEAL RUPTURE OF THE TUBE (diagrammatic; after Giles). The chorion and amnion have both been torn, and the fœtus has escaped from the gestation sac; the placental portion of the chorion is injured. The fœtus will perish.

and 206). In intra-peritoneal rupture the placenta then grows out of the rent and becomes attached to the neighbouring peritoneal surfaces, while layers of lymph are deposited upon the exposed amnion from the surrounding peritoneum, forming a false membrane which constitutes a secondary gestation sac. This secondary sac becomes further strengthened by adhesion to the neighbouring peritoneal surface, including omentum, coils of intestine, and the abdominal parietes. The ovum is now known as a *secondary abdominal* (*intra-peritoneal*) *pregnancy*. Precisely similar results may follow extra-peritoneal rupture, and for the same reasons; the condition is then described as *secondary abdominal* (*intra-ligamentary*) *pregnancy* (fig. 206). Both intra-peritoneal and intra-ligamentary pregnancy may continue to term; the patient then usually passes through a 'false labour,' and the fœtus perishes. The occurrence of this false labour is a physiological point of

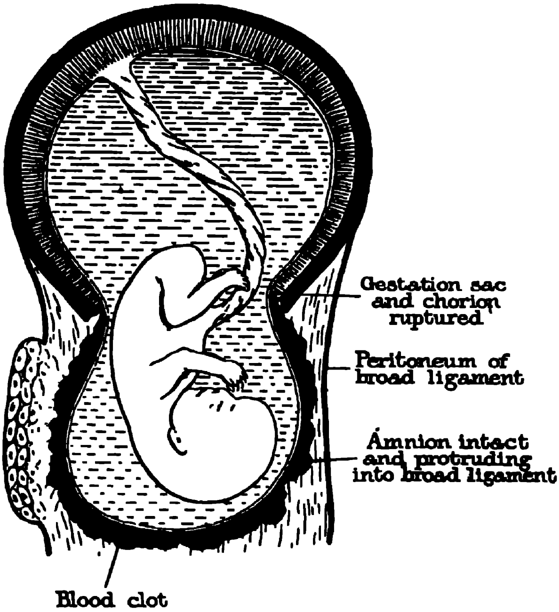
Gestation sac and chorion ruptured
Peritoneum of broad ligament
Amnion intact and protruding into broad ligament
Blood clot

FIG. 206.—INTRA-LIGAMENTARY RUPTURE OF THE TUBE (diagrammatic; after Giles). The amnion and the placental portion of the chorion are uninjured. The fœtus may survive.

great interest and importance, but we have no information as to its causation, or the mode in which it leads to the death of the fœtus. False labour is attended with severe abdominal pain, which is mistaken by the patient for labour, but there is no clinical evidence that uterine contractions play any part in its production. Intra-ligamentary pregnancy may undergo *secondary rupture* into the peritoneal cavity; even then the ovum is not in all cases destroyed, but may continue as an intra-peritoneal pregnancy.

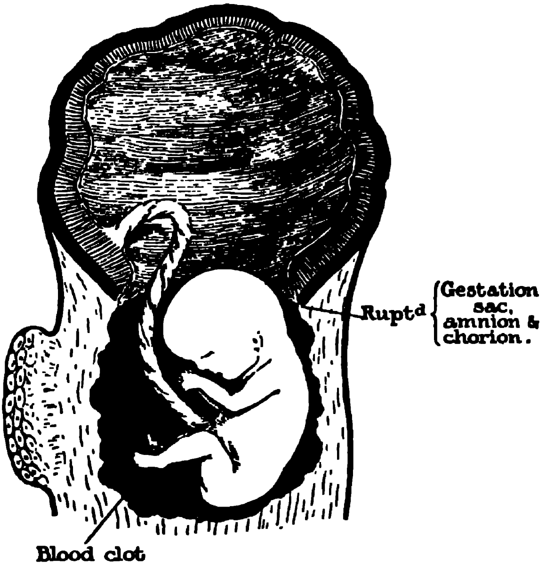

FIG. 207.—INTRA-LIGAMENTARY RUPTURE OF THE TUBE (diagrammatic; after Giles). The chorion and amnion have both been torn, and the placental portion of the chorion is injured. The fœtus will perish. Bleeding is intra-ligamentary.

In the intra-peritoneal form of secondary abdominal pregnancy the gestation sac consists of a membrane which is largely inflammatory in origin, and is composed of layers of lymph deposited upon the amnion, in which organisation has proceeded to a variable extent. This membrane becomes closely adherent internally to the amnion, externally to the abdominal walls, and to the viscera, which structures support it and add to its strength. A great deal of the placental blood supply is obtained from adherent omentum and mesentery.

In the intra-ligamentary form the gestation sac consists of the tissues composing the broad ligament, which are progressively expanded as the fœtus grows. This process involves great changes in the anatomical relations of the parts. Thus the peritoneum is raised from the pelvis, and stripped off the anterior abdominal wall, so that the reflection which corresponds to the floor of the utero-vesical pouch may exceed the height of the umbilicus. Posteriorly the level of the pouch of Douglas is raised, and the mesentery of the colon on either side may be opened up and stretched over the gestation sac. An incidental result of these changes is that in such cases the sac may be opened by an abdominal incision without traversing the peritoneal cavity at all.

Many cases are on record, both in ancient and in modern times, in which an extra-uterine fœtus has been retained within the abdominal cavity for many years after its death. In some of these cases the gestation sac has become infected from the bowel or the uterus, and suppuration has occurred, resulting in the formation of fistulous communications with the exterior, or with the neighbouring hollow viscera—large intestine, bladder and vagina. Through these fistulae fœtal bones are from time to time discharged. When, however, the sac remains free from infection the body of the fœtus shrinks by absorption of its fluid constituents, and upon the dried tissues lime-salts become freely deposited, converting it into a *lithopædion*. In this condition it may be retained for many years with little disturbance to the patient.

## CLINICAL FEATURES OF TUBAL PREGNANCY

This subject will be considered in relation to three stages: (*a*) before the occurrence of internal hæmorrhage, (*b*) after that occurrence, (*c*) in secondary abdominal pregnancy.

(*a*) **Before the Course of Gestation is interrupted.**—At this time tubal pregnancy gives rise to no more local or general disturbance than does an early pregnancy in the uterus. An important symptom often associated with this phase—namely, a brief period of amenorrhœa—is a most useful aid in diagnosis, but it is by no means always present. When a

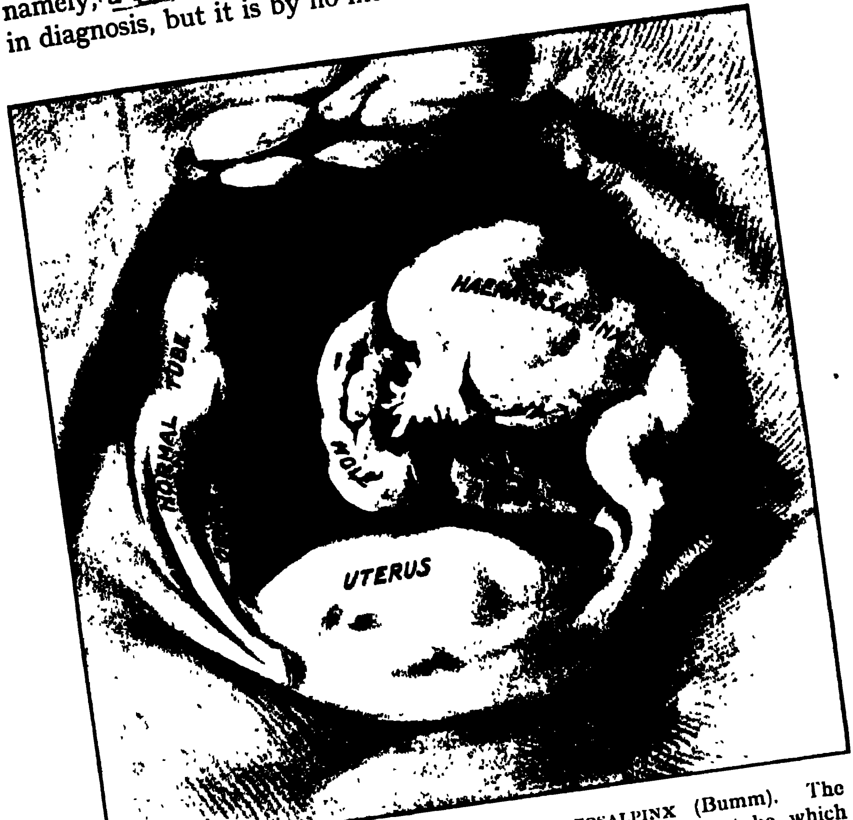

Fig. 208.—Tubal Abortion with Hæmatosalpinx (Bumm). The ovum, converted into a mole, has been expelled from the tube, which remains distended with blood. The gravid tube occupies the left posterior quarter of the pelvis, and is connected by a pedicle with the uterine cornu.

healthy adult woman, who is usually regular, goes for two or three weeks over the expected date of her period, there is a strong presumption of pregnancy, but at this time there may be nothing to indicate whether pregnancy is uterine or extra-uterine. In the latter case, however, amenorrhœa is of very brief duration, seldom more than seven or eight weeks; it then gives place to hæmorrhage. In something like

30 per cent. of cases there is no interruption of menstruation at all, and therefore, while amenorrhœa forms a useful positive indication, no importance whatever can be attached to its absence. As it is quite unusual for an extra-uterine gestation to continue undisturbed beyond the end of the second month, there is no time for the appearance of other general symptoms of pregnancy. But occasionally morning sickness and early breast changes may be met with.

The *unruptured gravid tube* forms an elastic swelling lying as a rule posteriorly or postero-laterally to the uterus (fig. 208); it may in rare cases be found in the utero-vesical pouch. Pulsating vessels are often to be felt beneath it. Its physical characters do not distinguish it from tubal enlargements due to other causes, and its nature can only be deduced from the accompanying symptoms.

It appears certain, from clinical observation, that symptoms other than those just described do not occur until hæmorrhage has taken place—either into the tube itself, into the peritoneal cavity, or into the broad ligament. In the majority of cases the first sign of disturbance is the occurrence of a little external bleeding from the uterus (metrorrhagia), which may precede by a few days any of the more serious symptoms which inevitably follow. These symptoms, which will be described below, are commonly regarded as the symptoms of extra-uterine gestation, but they are in reality *secondary* symptoms, inasmuch as they result not directly from the gestation, but from certain disturbances which either destroy the ovum or greatly modify the course of its development. Naturally the secondary symptoms are not uniform, for they depend upon the nature and extent of the damage which has been sustained by the ovum and the tube. In any case a marked and rapid transformation of the clinical features takes place, as soon as the normal course of gestation is disturbed.

(*b*) **After the Occurrence of Internal Bleeding.**—The uterine hæmorrhage continues and is usually steady, not irregular, moderate in amount, and dark in colour. Separation and discharge of the decidua may also occur, sometimes in the form of a complete cast of the uterus, more often in fragments; in some cases the discharge of the decidua is not recognised at all, and it is possible that it may be cast off gradually in the form of débris. The characters of the decidua are definite and uniform, and their recognition may be of considerable help in diagnosis.

The decidual membrane is smooth upon its inner and rough upon its outer surface, which is also often beset with small papillary elevations. Microscopically it is seen to consist of a superficial compact layer, and a deep reticulated or cavernous layer (fig. 209). The surface epithelium is almost entirely lost, and very few glands are to be found in the compact layer, which consists of closely packed masses of oval, round, or polygonal cells with large globular nuclei—

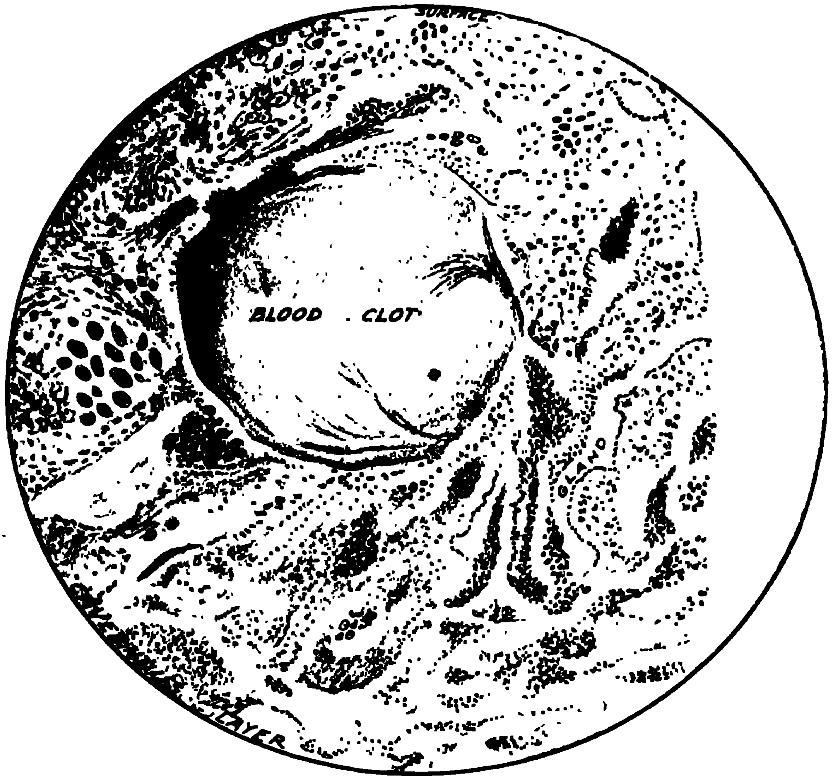

Fig. 209.—Decidual Cast from a Case of Extra-uterine Gestation. A large interstitial hæmorrhage is seen in the centre of the membrane; to the left are seen clusters of decidual cells.

the *decidual cells*. Many large venous sinuses and numerous interstitial hæmorrhages, sometimes of large size, are commonly found in this part of the membrane after it has been shed. The deep layer contains many irregularly dilated glands, in most of which the epithelium is fairly well preserved. The presence of decidual cells in small numbers in tissue passed from the uterus is not of much importance, but a membrane possessing the characters above described is distinctive of pregnancy. In cases of uterine pregnancy (abortion) traces of chorionic villi, or of chorionic epithelium, will usually be found attached to the decidual membrane, but naturally this will not be found in extra-uterine pregnancy.

The clinical results of internal bleeding in tubal pregnancy are variable and mainly depend upon two factors, viz. the *amount* and the *rapidity* of the bleeding. If the hæmorrhage is rapid and the amount of blood lost great, the effused blood becomes distributed over the general peritoneal cavity, and tends to accumulate in the most dependent parts, viz. the pouch of Douglas and the renal pouches; this is the *diffuse* type sometimes spoken of as 'intra-peritoneal flooding.' If the hæmorrhage is slow or the amount small, the effused blood becomes quickly shut off from the general peritoneal cavity by the formation of lymph around it; this is the *encysted* type.

**Diffuse Type of Intra-peritoneal Bleeding.**—Occasionally a single hæmorrhage occurs so rapid and profuse as to cause death in a few hours, before surgical aid can be obtained. In such a case the hæmorrhage is always intra-peritoneal, and may be due either to tubal rupture or to tubal abortion. More frequently a diffuse hæmorrhage is less severe, ceases spontaneously after a time, and while imperilling the patient's life, is not necessarily fatal. It may, however, recur after an interval and prove ultimately fatal. The initial attack of bleeding may occur without any exciting cause, when the patient is at rest in bed, or even when asleep; more often it appears to have been induced by some slight muscular effort, such as that entailed by ordinary domestic work or by the act of defæcation.

Severe abdominal pain, sudden in onset, situated in one or both iliac regions, is usually the first symptom. It is often quickly followed by vomiting, and may lead to faintness or, ~~less often,~~ to actual loss of consciousness from syncope. Upon these symptoms supervene, in cases of profuse bleeding, the signs and symptoms of concealed hæmorrhage—pallor, rapid and feeble pulse, deep laboured breathing (air-hunger), restlessness, coldness of the extremities or of the whole skin-surface of the body, sweating, depression of temperature. Slight hæmorrhage from the uterus will also usually occur.

The presence of a large amount of free blood in the peritoneal cavity can usually be detected by percussion ; when the patient is lying down, it gravitates into the flanks, which accordingly become dull, and the area of dulness shifts slowly when the position of the patient has been altered.

When a diffuse hæmorrhage, though severe, is not large enough immediately to imperil life the symptoms resemble those of the condition often called 'peritonism,' and are common, with variations, to many circumstances under which fluid suddenly escapes into the peritoneal cavity. These symptoms are acute abdominal pain, at first located to one iliac region, but soon becoming general, with more or less profound shock ; the symptoms of shock differ from those of profuse bleeding chiefly in the absence of restlessness and air-hunger. The pain may last for many hours, and may be accompanied by abdominal distension and by vomiting, but the latter is not persistent. Gradual improvement supervenes and in two or three days the symptoms generally subside. There is, however, great risk under these circumstances of renewal of the bleeding, which will manifest itself by recurrence of more or less acute attacks of pain and of some of the symptoms of shock. Even while the patient is confined to bed recurrences of bleeding may be met with ; a risk which is sufficiently explained by the anatomical points already referred to.

The *diagnosis* of tubal pregnancy under these conditions is sometimes fairly simple. When there has been a profuse loss of blood the fact that internal bleeding has occurred will be obvious from the signs already described ; a history of a ~~recent~~ short period of amenorrhœa giving place to slight uterine bleeding will suggest the possibility of ectopic pregnancy. Pelvic examination may show softening of the cervix and a swelling behind or to one side of the uterus which represents the gravid tube (fig. 208). *These findings together make up a strong presumptive case for the diagnosis of tubal pregnancy with internal bleeding.*

When the loss of blood has been less severe than this the symptoms are less characteristic, and there may be some doubt whether hæmorrhage, perforation of a hollow viscus, or acute inflammation has occurred. The history may be misleading, inasmuch as early uterine pregnancy may be associated with any of these surgical disasters in women in the fertile period of life. And further the local conditions may be misleading, for cases have occurred not infrequently in which a pelvic swelling taken for a gravid tube has been revealed by operation as an acutely inflamed ovary or small ovarian cyst. If the condition of the patient is not too serious to allow of delay, the further course of the case will often clear up the diagnosis, for after internal hæmorrhage has ceased the general condition rapidly improves, while with such lesions as perforative peritonitis the general condition as rapidly deteriorates.

**Encysted Type of Intra-peritoneal Bleeding.**—In this form bleeding is more gradual than in the diffuse type, and the signs of internal hæmorrhage are usually inconspicuous. Nevertheless a certain amount of pallor and quickening of the pulse are present from the first, and may become more pronounced as the case proceeds. The two prominent symptoms constantly encountered are *pain* and *uterine hæmorrhage.*

The pain which is met with is almost always sudden in onset, and usually spontaneous, although muscular effort may appear to excite it; it is always severe, and may be intense; beginning in one or other iliac region it soon affects the whole abdomen, but later on may again become localised; it is frequently attended with vomiting and other signs of shock, sometimes with faintness or actual syncope; after lasting acutely for several hours it subsides, and thereafter may recur at varying intervals of a few days or a week, until several attacks have been sustained; sometimes continuous pain without exacerbations follows the first attack

The uterine hæmorrhage often begins before the first attack of pain; it shows the characters already mentioned, and may be accompanied by discharge of a decidual cast, either complete or in fragments.

After a few days an irregular elevation of the temperature occurs as a rule, and this symptom, in association with pain, often leads to the erroneous diagnosis of an inflammatory lesion. This rise of temperature is due in part to the peritonitic reaction which occurs around the effused blood and results in its isolation, and in part to the absorption of fibrin ferment or other products from the dead blood.

The blood which is slowly poured into the peritoneal cavity from the gravid tube tends to accumulate in the most dependent part of the peritoneal cavity—the pouch of Douglas. In some cases, probably when the bleeding is very slow, the effused blood does not reach the pouch of Douglas at all; it becomes rapidly encysted by adhesive peritonitis and is detained in contact with the bleeding part, which may be the abdominal ostium, or a rent in some other part of the tube. An encysted collection of blood in the pelvic peritoneal cavity is called a *pelvic hæmatocele*; when formed around the abdominal ostium it is distinguished as *peritubal,* when formed upon the proximal part of the tube it is called *paratubal* (Handley). Around these encysted collections of blood a *false capsule* is rapidly formed by the deposition of layers of lymph externally, and beneath this by organisation of the superficial layers of the blood clot. In this way a membrane one-eighth to one-quarter of an inch in thickness may be formed. In those rare instances where intraligamentary rupture occurs, the blood is slowly poured out between the layers of the broad ligament, and this condition is distinguished as a *pelvic hæmatoma.* Hæmatocele of the pouch of Douglas is far commoner than either of the other varieties.

In some instances considerable *intra-tubal* hæmorrhage may occur without any escape of blood from the tube taking place. An acute attack of pain, or it may be recurrent attacks, indistinguishable from those just described, usually accompanies this form of hæmorrhage also.

*Diagnosis of the Encysted Type.*—From the symptoms which have been already described, a presumptive diagnosis of tubal pregnancy with internal bleeding can generally be made. The physical signs met with are mainly those of a pelvic effusion, the nature of the effusion being inferred from the history and the symptoms.

A large pelvic *hæmatocele* forms a swelling extending upwards above the pubes (fig. 210). The hypogastric region is prominent, and pressure causes considerable pain. On palpation a dome-shaped swelling, ill-defined in outline and elastic in consistence, can be made out. Its position is usually, but not always, mesial. On percussion the note is subresonant. The surface of the swelling felt in the hypogastrium corresponds to the roof of the hæmatocele, which is formed by omentum and coils of intestine adherent to one another and to the mass of effused blood beneath them.

On vaginal examination, it will be found that the whole uterus including the cervix is displaced forwards and pressed close up to the back of the symphysis pubis; sometimes it is somewhat elevated, and may be displaced a little to one or other side of the middle line. Softening of the lips of the os externum may be recognisable. The rest of the pelvis is occupied by the effusion which has crowded the uterus out of its normal position; sometimes it depresses the floor of the pouch of Douglas and causes bulging of the posterior fornix. The consistence of the swelling is generally elastic; it may be almost doughy in parts, or, on the other hand, areas which feel firm and solid may be encountered. These variations are probably due to incomplete or irregular coagulation of blood. The pelvic mass is continuous with that felt above the pubes. On rectal examination it may be found to fill the sacral hollow (fig. 210) and compress the bowel; thickening of the utero-sacral folds is also commonly felt and probably results from coagulation taking place upon their surfaces.

*Differential Diagnosis of Pelvic Hæmatocele.*—In considering this point it must be recollected that, although the great majority of pelvic hæmatoceles are due to ectopic pregnancy, this is not invariably the case. Thus Jayle has recently collected seventeen cases due to rupture of a small blood cyst in the ovary, and others have been recorded from rupture of a tubo-ovarian varicocele.

A pelvic hæmatocele must be carefully distinguished from *retroversion* of the *gravid uterus*: the differential diagnosis is not always easy. It is, however, of practical importance, for if the treatment of a retroverted gravid uterus was applied to a case of pelvic hæmatocele, disaster might follow from rupture of the hæmatocele.

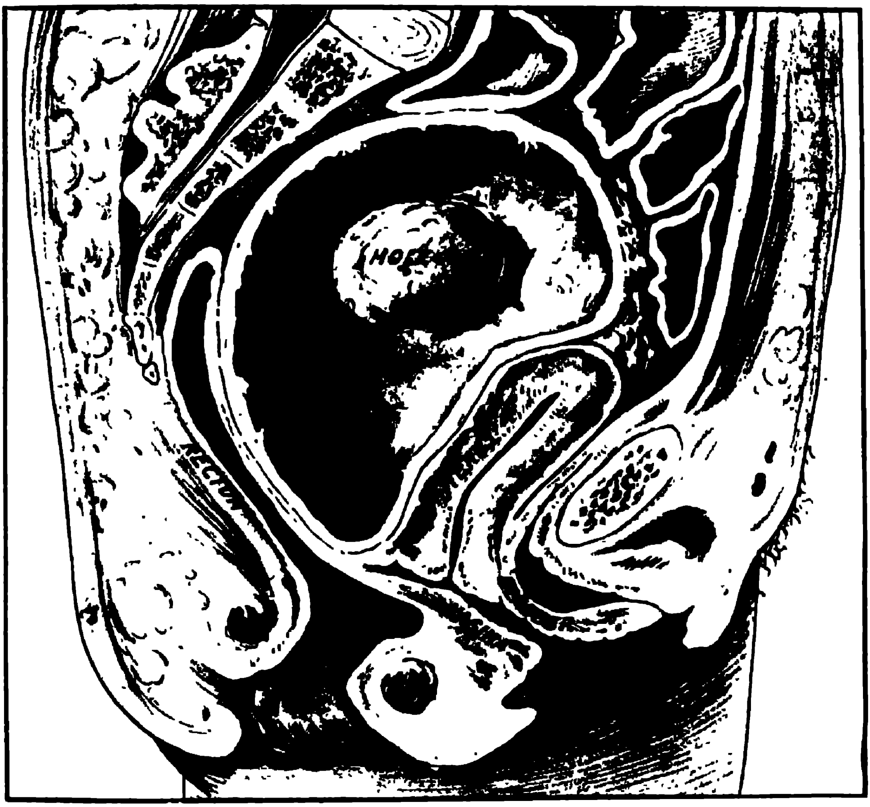

FIG. 210.—PELVIC HÆMATOCELE SHOWN IN MESIAL SAGITTAL SECTION (Bumm). The section shows the hæmatocele distending the pouch of Douglas and pushing the uterus forwards. Attached to the left wall of the hæmatocele is a tubal mole.

The history usually presents well-defined differences. Thus retention and incontinence of urine, common in retroversion when the uterus has grown large enough to fill the pelvis, are exceptional with hæmatocele. Bleeding from the uterus may occur with either, but the discharge of decidual tissue is only met with in extra-uterine cases. Attacks of severe abdominal pain strongly favour the diagnosis of hæmatocele.

On bimanual examination, the bladder being empty, it is necessary, in order to recognise that the condition is a pelvic hæmatocele, to determine that the body of the uterus lies in front of the swelling which fills the pouch of Douglas. Anæsthesia may be required to determine this point satisfactorily. If the fundus cannot be felt in front, or to one or other side, it may be concluded that the swelling felt posteriorly is the enlarged uterine body. Two points of minor importance may assist the diagnosis, viz. the gravid uterus is of more uniform consistence than the hæmatocele, and may sometimes be felt to undergo intermittent contractions.

An *ovarian cyst* which has become incarcerated by adhesions in the pouch of Douglas, and is sufficiently large to occupy the whole pelvic cavity, gives rise to the same displacement of the uterus as a hæmatocele. The consistence of the swelling is, however, uniform, and more tense or resistant than the hæmatocele, and its general outline is better defined. Menstruation may be unaffected; the commonest disturbance, if any, being in the direction of menorrhagia. There is no softening of the cervix, and no irregular uterine bleeding. Attacks of severe abdominal pain favour the diagnosis of hæmatocele.

*Inflammatory* (peritonitic) effusions in the pouch of Douglas can best be distinguished by a careful consideration of the history (see p. 430), and in this connection it should be borne in mind that while fever is the initial symptom in pelvic peritonitis, it is a comparatively late one in hæmatocele. In inflammatory cases the general condition of the patient does not suggest hæmorrhage; there is no pallor and the pulse, though quick, is of high tension. The local signs of the two conditions are very similar, but the local tenderness in the case of the inflammatory effusion is much greater than in the case of the hæmatocele.

Peri- and para-tubal hæmatoceles cannot be clinically distinguished from a hæmatosalpinx. Effusions of blood into the broad ligament (hæmatoma) closely resemble inflammatory effusions in the same position (cellulitis), and are best distinguished by the clinical history.

**Secondary Abdominal Pregnancy.**—The clinical diagnosis of this condition presents considerable difficulties, and in the great majority of the recorded cases diagnosis has not been made until, following upon the death of the fœtus, the gestation sac has become altered by infection or by shrinkage. The history of the pregnancy presents abnormal features, such as attacks of abdominal pain in the early months, usually accompanied by hæmorrhage; but when the ovum survives a tubal rupture, the amount of internal bleeding appears to be inconsiderable, and the accompanying symptoms less urgent than those described above. In advanced pregnancy the local conditions may closely resemble those of normal gestation, the position of the body of the fœtus, and of the presenting part, showing little abnormality. Careful examination under anæsthesia would, however, show that the uterus was small, and was displaced to some extent by the gestation sac, while the use of the sound would indicate that the uterine cavity was only slightly enlarged and empty. The differential diagnosis of the intra-ligamentary from the intra-peritoneal variety presents even greater difficulties; in the latter the fœtus usually lies above the pelvic brim and is more freely movable; while in the former the head may lie unusually low in the pelvis to one or other side, and the mobility of the fœtus may be unusually limited. But absolute reliance cannot be placed upon these points.

The fœtus often perishes before full time is reached; it may, however, survive until term has been exceeded. A definite attack of pain such as could be called a 'false labour' does not in all cases occur; but when met with it is usually synchronous with the death of the fœtus. After this occurrence the abdominal enlargement may gradually decrease from absorption of fluid; on the other hand it may rapidly increase in size either from hæmorrhage into the gestation sac, or from infection reaching it from the bowel. Infection is usually distinguishable from hæmorrhage by being accompanied by fever.

Old cases of secondary abdominal pregnancy, in which the fœtus has been retained for prolonged periods after its death, are almost incapable of being clinically diagnosed. It is curious to note the extraordinary resistance to infection from adherent intestine which this condition exemplifies. Notwithstanding the large mass of dead matter which the gestation sac contains, and its contiguity to sources of infection, the processes of dry gangrene (mummification) and subsequent encrustation with lime salts may proceed without apparent interruption, and the presence of the large foreign body thus built up may be tolerated for many years with little apparent inconvenience. Many instances are on record of a lithopædion being found in the body of a woman who died of some independent malady, at an advanced age. Thus Kuchenmiester has recorded the case of a woman who died at the age of eighty-seven, and in whose body a lithopædion was found which, it was estimated, had been retained for a period of fifty-seven years. In some cases, however, the lithopædion has proved to be the direct cause of death from intestinal obstruction.

## TREATMENT OF EXTRA-UTERINE PREGNANCY

This subject must be considered in relation to the various clinical phases just described.

(1) In the case of an *unruptured extra-uterine gestation*, the gravid tube or ovary should be removed without delay by abdominal section. The great probability that internal hæmorrhage will occur, with its serious risks to life, necessitates this preventive operation being performed in all cases. The operation required is that afterwards described on p. 547; in the case of tubal pregnancy, the corresponding ovary is as a rule healthy and should not be removed. The gravid tube can be excised by securing the mesosalpinx with two or three ligatures and dividing the tube close to its uterine attachment (salpingectomy). The procedure is simple, and the prognosis correspondingly favourable.

(2) In the case of *internal hæmorrhage* of the *diffuse type*, operation is again almost invariably necessary. The conditions may here be very unfavourable for surgical interference, as when the patient has been brought nearly to death by a profuse intra-peritoneal flooding. The most favourable results will be obtained if it is possible to wait for twelve hours until the patient has had time to recover from the attendant shock; this, of course, cannot

be done if the bleeding continues, but, as a rule, the hæmorrhage ceases spontaneously after a rapid profuse loss, and gradual improvement in the general condition of the patient then justifies a delay of a few hours. If the condition of the patient, is, however, deteriorating instead of improving, delay will be fatal; the abdomen must be immediately opened and the bleeding vessels secured. Success may be obtained in cases apparently desperate, and the responsibility which the operator undoubtedly takes in operating is, under the circumstances, perfectly justifiable. Saline transfusion into the median basilic vein should be practised, in the worst cases, before or during the operation, and is of the greatest assistance to success. Rapid work is necessary when the patient is under the anæsthetic; the pedicle should therefore be secured in the simplest and most expeditious manner possible. As much of the effused blood as possible should be cleared away, but time must not be consumed in making a complete peritoneal toilet. One to two pints of warm, sterile, saline solution may be poured into the peritoneal cavity and left to be absorbed before the wound is closed.

In cases of *encysted internal hæmorrhage* there is no necessity for immediate operation, but in the majority of cases recovery does not take place without surgical interference of some character. *Palliative treatment* has been extensively resorted to in such cases; it consists in confining the patient strictly to bed, and trusting to absorption of the dead blood taking place by natural processes. This may undoubtedly occur, but the process is very slow and many weeks, running even into months, may elapse before the effusion has disappeared. Little or nothing can be done by medical measures to hasten absorption. In some cases a hæmatocele may be observed to increase steadily in size, notwithstanding that the patient is confined to bed; this is generally due to progressive or repeated hæmorrhage from the gestation sac. Increase in size may, however, be due to infection of the hæmatocele, and is then usually accompanied by aggravated pain and fever. It follows that when palliative treatment is decided upon, a guarded prognosis should be given, for resort may ultimately be necessary to some operative procedure.

A pelvic hæmatocele may be attacked from the abdomen, or from the vagina by posterior colpotomy. The advantage of the former is that the damaged tube is completely exposed, and can be removed; the pelvic peritoneal cavity can be properly cleared out, and the wound closed without drainage. When the vaginal operation is adopted, the hæmatocele is simply evacuated and drained (see p. 599); evacuation is necessarily incomplete and, as coagulated blood does not come away freely by drainage, several weeks may elapse before the cavity has completely closed up. The advantage is that the risks attending opening of the general peritoneal cavity are avoided, and in cases of infected hæmatocele this risk is undoubtedly a serious one. Vaginal drainage is therefore the operation of choice in an infected hæmatocele; in other cases the abdominal operation is, as a rule, to be preferred as being more thorough and followed by shorter convalescence.

(3) *Secondary abdominal pregnancy*, whether intra-ligamentary or intra-peritoneal, can be dealt with only by operative measures. The difficulty of distinguishing the two varieties has been already referred to; it practically precludes any attempt to apply different methods of treatment to them. We shall therefore consider the method of dealing with such cases, firstly when the *fœtus is alive and viable,* and secondly when *the fœtus is dead.*

(*a*) It is but seldom that cases come under observation while the child is alive, and the number of recorded cases operated upon is relatively small. The ideal procedure in such cases doubtless is to operate at once with the view of securing the survival of the child as well as the mother. Two great difficulties have to be encountered.

In the first place the records show that even if delivered alive the chances of the child ultimately surviving are very small. Bland-Sutton has collated eight cases operated upon between the thirty-fourth week and term, and of these six infants died within a few hours of birth, the other two did not survive the first year.

In the second place the presence of a quick placenta constitutes a formidable technical difficulty in operating. In opening the gestation sac it may be practicable, in either variety, to make the incision through a part which is closely incorporated with the abdominal parietes, when the operation may be conducted extra-peritoneally throughout. With this object the incision may be made in the linea semilunaris instead of the linea alba. After extracting the child and dividing the cord, the membranes should be peeled off the wall of the sac and the limits of the placenta thus defined. Three possible courses are available for dealing with the placenta: firstly, to peel it off and control hæmorrhage by ligature, forceps, and packing; secondly, to leave it untouched, to keep the gestation sac open by stitching its edges to the lower part of the wound, and then to allow the placenta to slough and separate spontaneously; thirdly, to leave the placenta untouched, close the wound completely, and trust to its absorption by natural processes. The first course leads to very profuse bleeding which is difficult to control; although it has been occasionally successful, in many cases the operator has been obliged to abandon the attempt, and instead to control the bleeding by plugging and leave the placenta in its place. If the immediate difficulty of controlling the hæmorrhage can be surmounted, the results are good. The second course is naturally attended by the serious risks of septic infection, and by a prolonged and dangerous convalescence. If this method is adopted a counter-opening should if possible be made through the posterior fornix into the deepest part of the gestation sac, in order to provide more efficient drainage. Experience of these alternative methods is not at present sufficiently large to permit of one being definitely preferred to the others. The third course has been suggested but not tried; it is theoretically sound if complete asepsis in operating can be guaranteed. The least failure in this respect might, however, lead to disastrous results.

The difficulties of dealing with the quick placenta have induced many operators to postpone operative interference until the death of the child has occurred in the natural course of events, no attempt being made to save it.

(*b*) After the death of the child the only maternal risk to be considered is that of infection of the sac. The usual practice has been to delay operation for several weeks in order to allow time for thrombosis of the placental sinuses to occur and thus facilitate separation of the placenta.

This is the safest course to pursue so long as no suspicion of infection has arisen. Such cases should all be dealt with, if possible, by an extra-peritoneal incision; the placenta can then be peeled off, oozing controlled by ligature or packing, and drainage established by both the suprapubic and vaginal routes.

# PART X

## MORBID CONDITIONS OF THE VAGINA AND VULVA

### VAGINITIS

Inflammation of the vaginal walls is not of frequent occurrence, nor when it occurs is it of great clinical importance. The vaginal canal possesses certain natural defences against microbic infection from without (see p. 50), and it is probable that the stratified arrangement of the epithelial covering, and the absence of glands, render penetration by pathogenic organisms both slow and difficult. At the same time inflammation may occur, the infective agent being sometimes introduced from without, and sometimes carried to the vagina by discharges from the upper part of the genital tract.

**Vaginitis and Gonorrhœa.**—It is now established that the vaginal mucous membrane is very rarely attacked in the adult by the gonococcus so as to set up a true gonorrhœal vaginitis. That this may occur has, however, been shown by the demonstration of gonococci in the deep epithelial cells in cases of vaginitis. In children the susceptibility of the vaginal walls is greater, and acute gonorrhœal vaginitis spreading from the vulva is not uncommon. There is, however, no doubt that a slight vaginitis is a frequent accompaniment of chronic cervical gonorrhœa, and if not due to the gonococcus it is no doubt set up by the secondary organisms which are constantly met with in long-standing cases of gonorrhœal discharge. Such organisms can always be found in the pus from cervical gonorrhœa.

**Catarrhal Vaginitis.**—This form of vaginitis is fairly common, being one of the most frequent causes of leucorrhœa. It is seldom met with in an acute form. In the common, chronic form the mucous membrane is reddened and there is a fairly abundant, yellowish, muco-purulent discharge. On careful inspection of the vaginal wall numerous small areas of a deeper red than the surrounding mucosa are apparent ; sometimes these spots bleed when firmly wiped with cotton wool. The changes are often most marked in the vaginal fornices. Occasionally small vesicles or pustules may be observed on the surface. Microscopically the vaginal wall shows round-celled infiltration of the sub-epithelial connective tissue, and extensive desquamation of the superficial epithelial layers ; at spots corresponding to the deep red areas the epithelium may be completely shed, laying bare the connective tissue. The discharge is neutral or alkaline in reaction, and contains many pus cells in addition to shed epithelium.

In women who have passed the climacteric age, or in younger women after an artificial or operative menopause has been produced, a severe form of catarrhal vaginitis is often met with which may be called *senile vaginitis*. In this form the deep red areas already noted are large and numerous, and often especially affect the ostium vaginae. Epithelial desquamation is more extensive, and from the formation of large areas of superficial ulceration two results may follow : (1) fibrotic thickening and contraction of the connective tissue may occur, leading to irregular puckering of the vaginal wall or to narrowing of the lumen ; (2) abraded surfaces which become apposed to one another may adhere, forming transverse septa, or, when affecting the fornices, shutting off small pockets from the main vaginal canal.

This form of vaginitis is accompanied by a profuse, thin, purulent discharge which may be blood-stained. The relative severity of the process is to be attributed to atrophy of the mucosa and loss of the protective vaginal secretion, which renders the tissues less able to resist bacterial invasion.

Three specific forms of vaginitis unrelated to the above must be mentioned, but their occurrence is rare, viz. : (1) *Diphtheritic* vaginitis, characterised by the formation of a false membrane and due to infection by Löffler's bacillus ; (2) *Septic* vaginitis, which may occur in the puerperium as a result of the infection of vaginal lacerations ; or apart from child-bearing it may be secondary to ulceration from malignant disease or from retained pessaries, or may arise from infection set up by foul discharges from a sloughing fibroid, etc. ; (3) *Emphysematous* vaginitis, which is a rare form of septic infection, characterised by the formation of bullae containing gas, in the subepithelial connective tissue.

**Symptoms and Treatment of Vaginitis.**—The symptoms of *chronic* vaginitis are discharge, pain, and vulval irritation ; to these are sometimes added dyspareunia, and pain on micturition. The discharge is often abundant, and to many women the presence of any discharge causes annoyance and mental distress. It is usually yellowish-white in colour, and in the senile form may be blood-stained ; occasionally there is a slightly offensive odour. Burning internal pain, or pain over the sacrum, is often complained of, and sometimes pruritus accompanies it (see p. 500). As a rule the sensitiveness of the vaginal walls is not much increased, and the passage of a speculum is readily borne. When abrasion of the ostium vaginae is present, as in old women, the passage of urine over the raw areas may cause considerable pain. The only symptom to which the late stages of senile vaginitis attended by contraction give rise, is dyspareunia.

*Acute* vaginitis gives rise to the same symptoms in a more intense form ; except in children it is not accompanied by fever.

Vaginitis is curable by douching and local applications, supplemented by attention to the general health and avoidance of local irritation.

Douches are chiefly useful in removing discharges, and thus lessening the irritation which their contact with the mucosa causes, and in preventing the decomposition of retained discharges. The simple saline douche consisting of a teaspoonful of sodium chloride to a pint of warm water is the most generally useful, or one of the weak antiseptic douches may be employed instead (see p. 615). It is impossible for the solutions used as antiseptic douches to exercise any marked bactericidal action upon organisms which have penetrated the vaginal epithelium.

Local applications are also required and may be made directly through a speculum, or by the use of medicated vaginal pessaries. Surgical disinfection of the vaginal walls may be necessary in gonorrhœal cases. The most useful applications *per speculum* are solution of nitrate of silver (10g. to 20g. to ℥i) and a 2 per cent. solution of iodine; the vaginal walls may be swabbed with these solutions twice or three times a week, after careful wiping with cotton-wool swabs to remove secretion. Medicated pessaries containing carbolic acid, resorcin, thymol and similar antiseptic substances may be introduced by the patient into the vagina every night; as the medium melts the antiseptic becomes distributed over the vaginal walls. The douche should be used shortly before introducing the medicated pessary.

General treatment consists in the suspension of marital intercourse, avoidance of alcohol and cigarette smoking, and attention to the daily evacuation of the bowels. If gouty manifestations are also present, treatment should be directed to this condition, which appears to favour the occurrence or the persistence of a mild form of vaginitis.

## ULCERATION OF THE VAGINA

Ulceration occurs under the following conditions:

(1) From pressure exerted by a neglected or ill-fitting pessary; occasionally also from foreign bodies introduced for purposes of masturbation, or for the prevention of conception, or in insane persons, with no purpose whatever. Fistulous communications with the rectum or the bladder may result from this form of ulceration.

(2) From lacerations which have become infected; these may occur in the puerperium in association with sapræmia or septicæmia, or at other times from traumatism.

(3) From tuberculous or syphilitic deposits, or from malignant growths.

Local or general vaginitis necessarily accompanies ulceration.

## NEW GROWTHS

**Vaginal Cysts.**—Small cystic tumours of the vaginal wall are not uncommon, but they very rarely exceed the size of a cricket ball. They are more often met with on the anterior and lateral walls than on the posterior wall. They bulge into the vaginal canal, the covering mucous membrane becoming thin and translucent. Occasionally they become polypoid. In the anterior wall they are often accompanied by prolapse (cystocele); indeed these two conditions may be readily mistaken for one another, for the cyst may be large enough to protrude through the vulva (fig. 211). The larger ones may also burrow deeply into the pelvic cellular tissue. The contents are usually thin and colourless, but may be tinted by altered blood. In the smaller cysts a single layer of columnar epithelium is generally found; in the larger cysts this is often entirely, or almost entirely, lost; they are almost always unilocular.

Cysts of this character are believed to arise from persistent portions of Gartner's duct (see p. 44). Very rarely multilocular cyst-adenomata occur in the vagina; occasionally, also, small cysts with an endothelial lining are found, which have no doubt arisen from dilated lymphatics.

*Symptoms and Treatment.*—Vaginal cysts give rise only to symptoms of mechanical origin; they may protrude at the vulva, causing discomfort and bearing-down pain, or they may occasion difficulty in coitus.

They may be dealt with surgically by partial excision, or by complete excision. In the case of cysts of moderate size the bulging cyst wall may be removed with scissors, and the divided edges of the vaginal mucosa and the lining of the cyst united to one another with catgut stitches. The exposed base of the cyst then becomes rapidly incorporated in the vaginal wall, and overgrown with the normal stratified epithelium. In the case of cysts which have burrowed into the pelvic cellular tissue a deep incision through the lateral vaginal wall must be necessary in order to enucleate them.

**Vaginal fibroids** are much rarer than cysts. In structure and appearance they resemble uterine fibroids, but the proportion of muscle which they contain is relatively small.

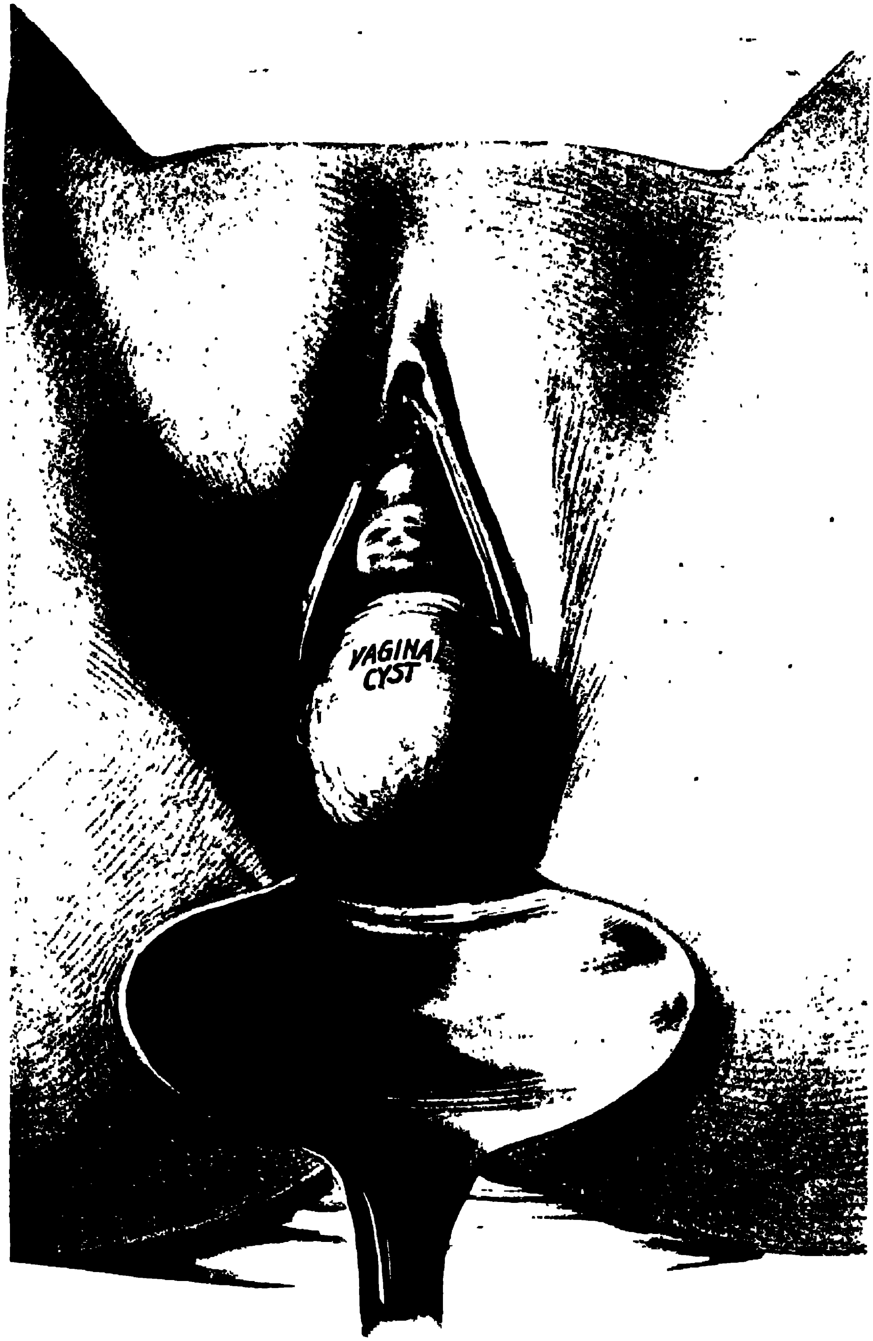

**Fig. 211.**—Cyst of the Anterior Vaginal Wall. The cyst protrudes through the vulva when exposed with a speculum.

They seldom exceed the size of a cricket ball, and are often pediculated; they are much more frequently met with in the anterior than in the posterior wall. Unlike uterine fibroids they are generally solitary. They give rise to mechanical symptoms only, and can be readily removed by enucleation.

**Carcinoma of the Vagina.**—Cancer is met with in the vagina as a primary or as a secondary growth.

*Primary cancer* is rare, the subjects of the disease being usually elderly women, although a few cases have occurred between twenty-five and thirty years of age. In some cases it has supervened upon prolonged irritation from a neglected pessary; occasionally it complicates prolapse of the vaginal walls. In the majority of instances the disease begins in the posterior wall in the form of a circumscribed area of induration; this enlarges in all directions and tends to become ulcerated superficially. Several isolated patches of the disease may be met with, or it may surround the vaginal canal forming an annular stricture. The paravaginal cellular tissue is early infiltrated; when the neighbourhood of the ostium vaginae is attacked the inguinal glands may become indurated; from the remainder of the canal the lymphatics pass with those of the cervix to the deep hypogastric glands. A rectal fistula is a frequent accompaniment of the later stages; a bladder fistula may also be formed, but is of much rarer occurrence.

Histologically the growth presents the usual appearances of squamous-celled cancer.

*Secondary cancer* is more common and may be met with as an extension from cancer of the cervix or of the rectum; more rarely it arises from cancer of the uterine body or from chorionepithelioma, the metastases being formed from implantation of living cancer cells carried down from the uterus with blood or other discharges. An instance has also been recorded which was secondary to cancer of the Fallopian tube (p. 400).

The *symptoms* are indistinguishable from those of cancer of the cervix (see p. 288); the amount of bleeding is, however, small. Digital examination shows the vaginal wall to be the seat of the growth, and the cervix may be found at a higher level than the upper limit of the growth and quite unaffected by it. Fixation of the vagina occurs early from involvement of the perivaginal cellular tissue.

In the early stages excision of the affected portion of the vaginal canal may be practised, or, better still, the entire vagina and uterus may be taken away together *en masse* from below. This severe operation is not practicable if the cellular tissue has become affected. The prognosis as regards recurrence is unfavourable.

**Sarcoma** of the vagina is extremely rare, being much more uncommon even than carcinoma.

In children vesicular sarcoma, similar to that met with in the cervix, may occur; infants of one to three years of age have furnished the greater number of cases. The vesicular masses may fill the vagina and protrude at the vulva.

In adults sarcoma of the vagina may occur at any time from puberty to extreme old age. It may assume either a circumscribed or a diffused form; in the latter the growth surrounds the whole canal and considerable constriction of the lumen results.

In symptoms and general characters this disease resembles carcinoma; histological examination reveals the appearances characteristic of sarcoma in other parts. The only treatment likely to be useful is free excision of the whole of the vagina.✓

## INJURIES TO THE VAGINA AND THEIR RESULTS

The vagina is frequently *lacerated* in parturition, and from prolonged *compression* during labour portions of the anterior wall may slough, giving rise to a vesico-vaginal fistula. Sometimes the vaginal wall is *perforated* through violence; the commonest position is the posterior fornix, and septic peritonitis may result from this injury. This may occur in the procuring of an abortion by an unskilled person, or from self-mutilation by the insane. Severe lacerations of the vagina have occasionally occurred during *coitus*; such lacerations usually affect the posterior vaginal wall as an extension from the hymen; in some instances, however, extensive lacerations of the vaginal fornix have occurred leading to profuse bleeding.

The immediate treatment of vaginal lacerations consists in disinfection of the wound, arrest of bleeding, and repair by suture. Injuries involving the wall of the bladder frequently result later on in the formation of a vesico-vaginal fistula; this condition may accordingly be conveniently considered here, along with certain other forms of vaginal fistulae.

**Urinary Vaginal Fistulae.**—The commonest form is that in which direct communication is established between the bladder and the vagina (vesico-vaginal); sometimes, in extensive injuries, the anterior lip of the cervix may be destroyed, or so deeply torn that the cervical canal also communicates with the bladder (vesico-cervical). Occasionally direct communication is established between the ureter and the lateral vaginal fornix (uretero-vaginal); the usual cause is injury to the ureter in the course of such procedures as hysterectomy or the removal of retro-peritoneal pelvic tumours.

*Vesico-vaginal fistulae* are situated in the upper half of the anterior vaginal wall. They are seldom met with of larger size than will admit the tip of the index finger; exceptionally, however, fistulae of twice this size are seen, while on the other hand they may be as small as a pin's head. The larger ones are readily recognised on exposing the anterior vaginal wall with a duck-bill speculum. The vesical mucous membrane becomes prolapsed, and overhangs the edges of the aperture in dark red folds; the margin of the opening in the vaginal wall is formed by a dense white ring of cicatricial tissue. Urine may be seen escaping through it in small intermittent overflows, as it is delivered into the bladder through the ureters. The smallest fistulae are more difficult to discover; a probe gives assistance in the search, and if necessary a coloured, sterile fluid can be used to distend the bladder, when the escape into the vagina will be readily seen. The vaginal walls and vulva always show a good deal of inflammatory change set up by the constant irritation of the urinary overflow. The condition may be complicated by cystitis and decomposition of urine, when extensive excoriation of the mucous membranes and skin may occur.

Vesico-vaginal fistulae may also be set up in advanced stages of carcinoma of the cervix or vagina by direct invasion of the bladder wall, and ulceration of the growth.

*Ureteral fistulae* are situated in the vaginal fornices; the aperture is always small, and may be difficult to discover. The local changes in the vagina and vulva are the same as those just described.

Urinary fistulae, although they cause intense physical discomfort and mental distress, are not attended by serious consequences to the general health, and unless cystitis occurs the risk of ascending infection does not appear to be great. Bladder fistulae may be dealt with by the plastic operations to be described later on (p. 584). Ureteral fistulae are usually best dealt with by removal of the corresponding kidney, a careful cystoscopic examination being first made to determine which ureter has remained in communication with the bladder. Attempts to effect an anastomosis between the distal end of the divided ureter and the bladder have seldom been successful.

## VULVITIS

Inflammation of the vulva is usually due either to *gonorrhœa,* or to chronic *irritation.* Gonorrhœal vulvitis is common both in children and adults (see p. 438). A septic vulvitis may be due to direct infection of a wound, as sometimes occurs in the puerperium; more often it is associated with chronic irritation. Children who suffer from oxyurides, which are liable to wander from the anus into the vulva, are often subject to great irritation, which leads to scratching, and so to the infection of abrasions by dirty finger-nails. The same sequence of events may occur in adults from uncleanliness, from irritating vaginal discharges, or from the dermal irritation produced by hyper-acid, saccharine or ammoniacal urine. Gonorrhœa is the commonest cause of an acute vulvitis; irritation usually leads to the chronic form.

In *acute vulvitis* both pairs of labia and the clitoris become swollen, red, and tender; the redness may extend from the greater labia over the adjacent parts of the thighs, and over the perineum. There is at the same time a more or less abundant purulent discharge. If gonorrhœal, the inflammation usually spreads into the urethra and the ducts of Bartholin's gland; if not gonorrhœal these parts usually escape. The patient complains of heat and tenderness in the affected parts, and when the urethra is involved of scalding pain on micturition.

I~~n the chronic~~ form intense irritation is usually complained of, which leads to friction or scratching, and the appearances become modified by the presence of old and recent abrasions. The special characters of chronic gonorrhœal cases have been already mentioned.

Rarer forms of vulvitis are *aphthous vulvitis* or *thrush*, which sometimes occurs in weakly, ill-fed children; *diphtheritic vulvitis* with formation of a false membrane, which may occur along with the usual throat form of this disease; *gangrenous vulvitis* or *noma*, which sometimes occurs in young children as a sequel to the acute exanthemata. In the last-named form extensive sloughing occurs and the disease is usually fatal.

The *treatment* of gonorrhœal vulvitis has been already mentioned. In vulvitis due to chronic irritation the most important point is to remove the cause of the irritation, such as threadworms, and to enforce cleanliness. In adults the vulva may be disinfected under anæsthesia in a bad case, and subsequently treated with mild antiseptic lotions or ointments. In other cases irritation is the chief symptom, and the treatment is of necessity chiefly directed to its relief (see Pruritus Vulvae).

**Superficial Atresia of the Vulva.**—This form of atresia is a condition which is acquired either in infancy or childhood, and appears to be the result of adhesive inflammation set up by an acute infectious disease such as diphtheria. The posterior parts of the labia majora and the greater part of the nymphae become adherent to one another, so that the fossa navicularis is obliterated, the hymen concealed, and the vulval aperture almost entirely occluded (fig. 212). Usually the clitoris can be seen anteriorly, and a narrow channel can be demonstrated immediately behind the clitoris, passing downwards and backwards into the vagina. Through this small channel the menstrual secretion may escape, and in consequence the deformity may remain unrecognised until adult life is reached or until coitus is found to be impossible. Occasionally the occlusion of the vulva is complete and retention of menstrual fluid occurs.

The occluded portion of the vulva may be obviously

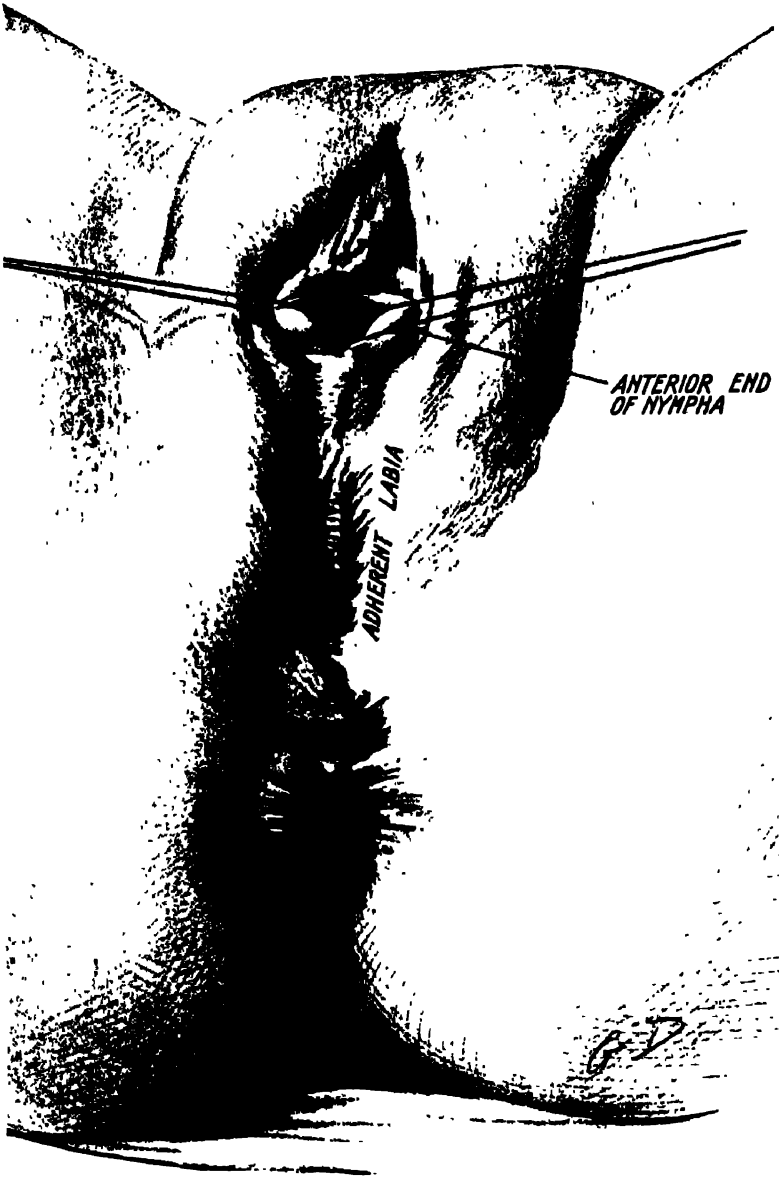

FIG. 212.—SUPERFICIAL ATRESIA OF THE VULVA IN AN ADULT. The anterior extremities of the nymphae have been drawn apart by ligatures, showing the narrow aperture leading to the vagina. The clitoris is seen to be unaffected.

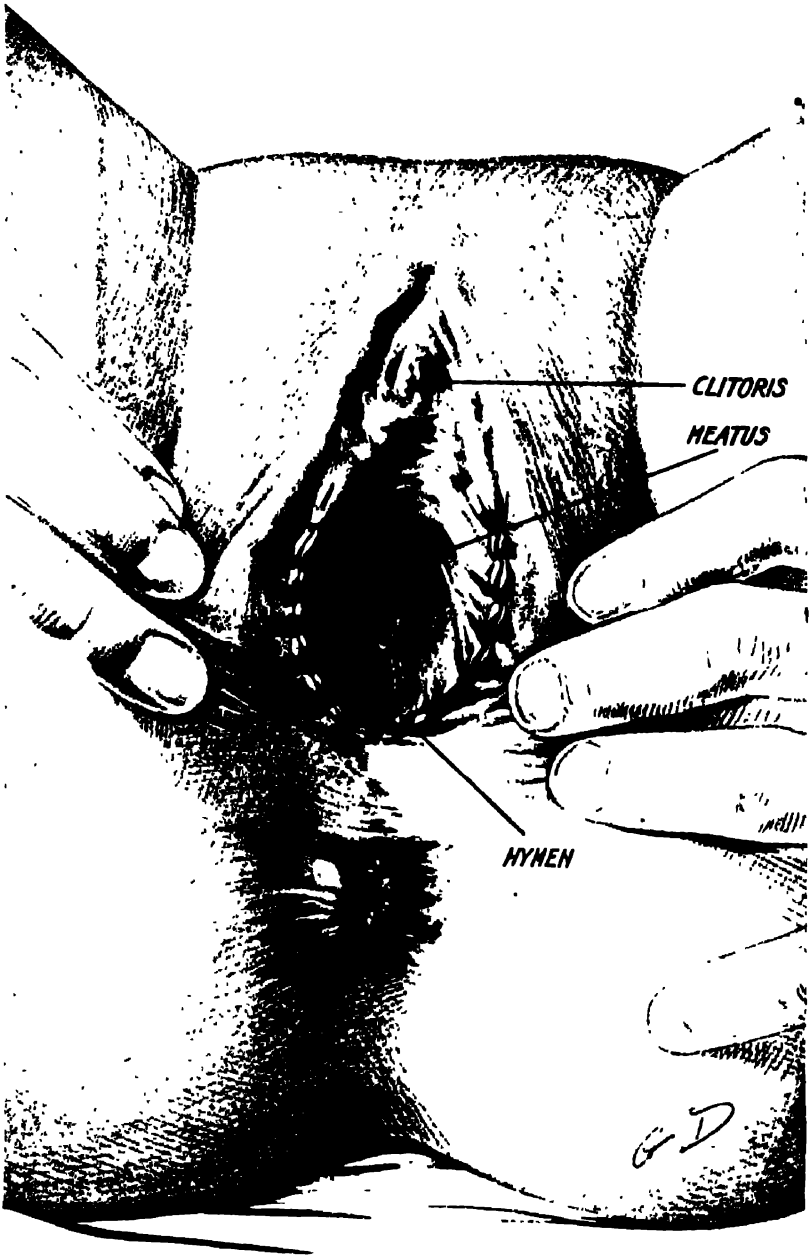

FIG. 213.—SUPERFICIAL ATRESIA OF THE VULVA AFTER OPERATION. The deep fossa navicularis is now exposed, upon the floor of which the hymen can be seen.

cicatrised, as shown by the wrinkled and uneven condition of the surface, similar to that seen in fig. 212. The small anterior aperture leading into the vagina is also seen behind the clitoris. The treatment consists in dividing the bridge of cicatricial tissue in the middle line from one end to the other. The flaps thus formed will be seen to have an inner mucous, and an outer cutaneous surface ; these surfaces are now united by sewing over the edges with catgut, as is shown in fig. 214. The great depth at which the hymen lay in this figure (photographed immediately after the operation) became rapidly reduced by consolidation and retraction of the divided tissues.

## VAGINISMUS

This condition consists in irritability of the sphincter muscles of the ostium vaginae (bulbo-cavernosus and anterior fibres of levator ani) whereby spasmodic contraction of these muscles is excited, sometimes by the slightest contact with the vulval mucous membrane, sometimes only by coitus. The outstanding symptom to which it gives rise is dyspareunia, and the subjects of the affection are usually recently married women of nervous temperament. Inasmuch as it often renders impossible the consummation of marriage, or the continuance of married life, its clinical importance is considerable.

On local examination a high degree of hyperæsthesia is always found, affecting generally the whole mucous surfaces of the vulva, and sometimes the cutaneous surfaces also. In consequence the contact of the examining finger causes the patient to shrink from the touch ; at the same time, the sphincter muscles of the vagina become tightly contracted so that the introduction of the finger may become difficult or impossible. Sometimes the spasm affects the adductor muscles of the thighs, and also the extensors of the spine, producing a species of opisthotonos. Under anæsthesia the spasm disappears. Not all cases are so severe as this, and the patient may be able to support a digital examination without great inconvenience. It may then be observed that the hyperæsthesia is confined to certain localities, those most frequently affected being the fossa navicularis and the vestibule. These parts may show slight lesions, such as superficial fissures, patches of redness or, in the case of the vestibule, a urethral caruncle. Sometimes the extreme tenderness is located in a hymeneal laceration. In some cases an unusually resistant and still intact hymen may be found, the morbid condition being then probably due to ineffectual attempts at coition.

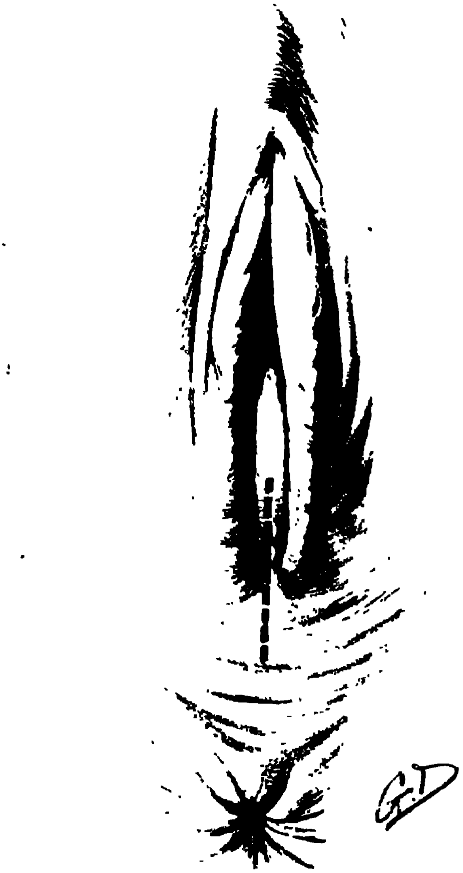

FIG. 214.—THE INCISION FOR CASES OF VAGINISMUS.

*Treatment.*—The first indication is to advise the suspension of all attempts at marital intercourse, as these only aggravate the disorder and render it less amenable to treatment. A complete and satisfactory examination of the vulva must be made, under anæsthesia in the majority of

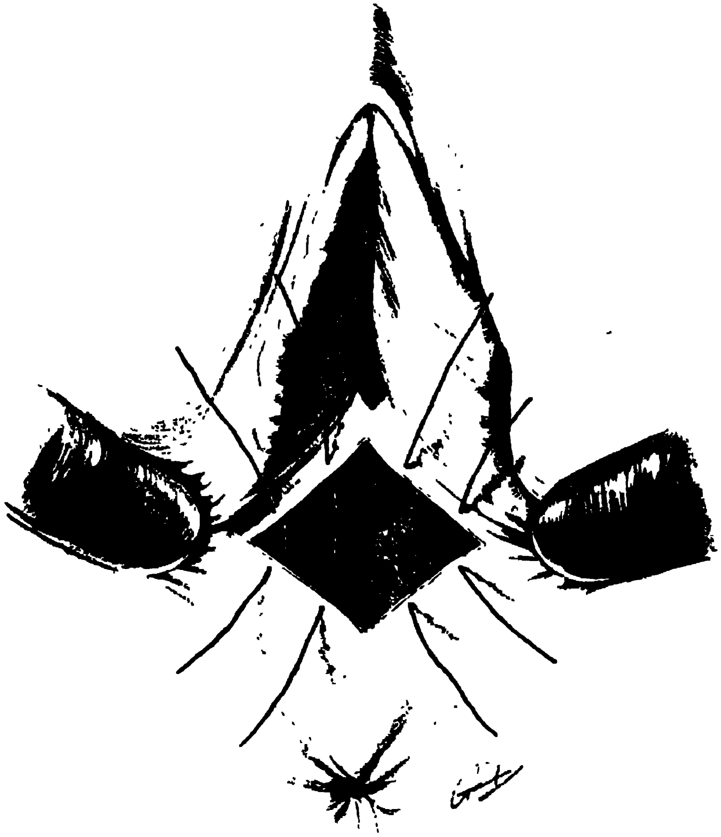

FIG. 215.—OPERATION FOR VAGINISMUS. Method of uniting the edges of the diamond-shaped raw area produced by lateral traction with the fingers.

cases, so that all local lesions, however trifling, may be observed. In slight cases, where the vulval mucosa is found to be healthy, a pledget of wool soaked in a 5 per cent. solution of cocaine and applied to the vulva ten minutes before coitus is attempted may succeed in overcoming the difficulty; or a 5 per cent. cocaine ointment may be applied in the same manner. When local lesions are present these must be dealt with; fissures generally heal rapidly after being cleansed, and swabbed with pure carbolic acid; if the hymen is inflamed, it should be entirely clipped away with scissors under anæsthesia. But after the removal of the original exciting cause the hyperæsthesia and spasm often persist. The further measures then required are incision of the superficial sphincter muscles, followed by gradual mechanical dilatation. The incision is best made in the middle line posteriorly, commencing at a point an inch above the hymen, and passing over the fossa navicularis and perineal body to a point an inch below the hymen (fig. 214). It should be deep enough to divide skin and mucous membranes and also the subjacent muscular fibres. Owing to the lateral pull of the divided tissues the median incision leaves a *transversely* spindle-shaped raw surface which can be closed by uniting the upper to the lower edge with interrupted sutures (fig. 215). Two lateral incisions of the same kind may be practised instead of the single median one. After the wound has healed the patient should be taught to use a tubular vulval dilator, such as that shown in fig. 216. At first cocaine ointment may be applied to the vulva before passing the dilator so as to avoid the discouragement occasioned by pain. It should be introduced every night or every second night, and allowed to remain in position for half an hour to one hour. This treatment persisted in, if necessary, for several weeks will nearly always effect a cure of the condition.

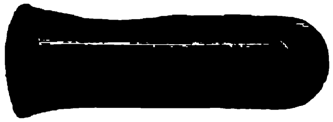

FIG. 216.—VAGINAL DILATOR. The instrument resembles a tubular speculum, but is closed at one end. It is made of glass or vulcanite

The galvanic current has been applied with success in cases of vaginismus unattended by local lesions.

## PRURITUS VULVAE

Irritation at the vulva is, of course, a symptom, not a disease; further, it may be occasioned by a variety of different morbid conditions, and may be accompanied by other symptoms besides itching. It is therefore not strictly correct, although it is clinically convenient, to consider it as a *disease* of the vulva. Sometimes in cases of intense itching no local morbid condition can be discovered. In most cases the irritation leads to friction and scratching of the affected parts, which result in changes in the local appearances which may obscure the original affection. The areas most frequently involved correspond to the clitoris and nymphae; in severe cases the greater labia, the whole of the ostium vaginae, the perineal body, the anus, and the post-anal region all may be affected. It may be met with in children, adults, or old women. In cases of slight severity, the irritation is felt chiefly or solely at night after retiring to bed; all gradations of severity may, however, occur, and in the severest cases there is constant and intolerable itching both day and night, the patient becoming haggard and emaciated from loss of sleep and ceaseless annoyance. Such cases have been known to terminate in insanity or suicide.

*Causes.*—A great variety of morbid conditions may give rise to pruritus; but they all may be classified in three groups:

(1) Chronic discharges which irritate the vulval mucous membrane. (2) Diseases primarily affecting the vulva. (3) Toxic conditions and neuroses.

(1) Discharges coming from the uterus or the vaginal walls do not as a rule occasion pruritus, but chronic gonorrhoeal discharges, and the septic discharges set up by a neglected pessary, frequently do so; the constant slight dribble of urine from a small vesico-vaginal fistula may set up intolerable pruritus, and much the same result may follow from incontinence of the bladder sphincter. Pruritus vulvae is also a frequent accompaniment of glycosuria and diabetes, but whether this is due to the irritant qualities of sugar-laden urine, or to nerve lesions produced by toxæmia resulting from the disease, is unsettled. In

adults of uncleanly habits accumulations of dirt or pediculi, and in children threadworms which migrate to the vulva from the anal canal, produce much the same results as vaginal discharges. Masturbation, as an occasional cause of pruritus, also belongs to this class.

(2) Chronic forms of ulceration, e.g. those due to tubercle or tertiary syphilis, cause itching, but these conditions are very rare. There are two skin diseases, which, however, are fairly common and usually set up this disorder in a severe form, viz. *eczema* and *leucoplakia*; while rarer local diseases such as *kraurosis*, and certain changes in the nerve-endings, may also cause pruritus.

(3) *Toxic Conditions and Neuroses.*—Cases in which pruritus vulvae is not accompanied by recognisable alterations in the appearance of the affected parts, except as the result of scratching, are usually attributable to a neurosis. The subjects of this form of pruritus are usually women of neurotic or hysterical temperament. A common exception is the pruritus of pregnancy, in its usual form only a mild affection, but sometimes intolerably severe and expanding into general irritation of the skin of the whole body. This affection is now more properly regarded as due to a form of gravidic toxæmia, although the nature of the toxæmia is unknown.

**Eczema vulvae** begins as a papular eruption, usually upon the inner surfaces of the greater labia, but which may also be found upon the lesser labia and upon the parts of the vulva covered with hair. The papules become vesicular and desquamate, leaving a moist surface around which an area of redness is quickly formed. In acute cases this erythematous zone may spread widely to the perineum and the inner aspects of the thighs. In old-standing cases the affected areas become dry and scaly. The acute stages are attended with pain, the chronic stages with irritation; impelled by the necessity of obtaining relief from the itching, the affected parts are scratched and rubbed, giving rise to abrasions which in time may become infected. Thus the original morbid appearances may be hidden beneath the secondary lesions due to scratching.

**Leucoplakia: Leucoplakic Vulvitis.**—This disease affects especially women who have reached or passed the climacteric period; it runs a chronic course and is attended, except in the final stages, with severe pruritus. The areas affected include the ostium vaginae, the nymphae and clitoris, the labia majora, and in some cases the perineum and inner aspects of the thighs.

In the early stages numerous dull red spots are seen upon the skin which appear excoriated but do not bleed; later these spots extend and become pale white, sodden, wrinkled and semi-opaque in appearance; in the final stages the whole vulva becomes involved, the opacity of the skin increases, and considerable retraction occurs, resulting in narrowing of the ostium vaginae. Painful cracks and fissures may be formed at all stages of the disease. The prominent symptom is uncontrollable itching until the stage of retraction has been reached, when the irritation disappears, and may give place to pain from the presence of fissures.

The histological changes have been the subject of careful study by Berkeley and Bonney. In the early stages there is thickening of the epithelium and round-celled infiltration of the subepithelial connective tissues; later the tissues immediately beneath the epithelium degenerate and the elastic elements are lost, while the epithelium tends to desquamate in excess and thus become thinned; finally complete fibrosis occurs beneath the epithelium, which is now greatly thinned; this corresponds to the stage of contraction. The middle stage of the disease is well shown in fig. 217, where the loss of staining reaction in the degenerated subepithelial tissues, and the excessive desquamation of the squamous cells, are well seen. Leucoplakia may be followed by carcinoma, and is, indeed, regarded by Berkeley and Bonney as a precancerous condition.

**Kraurosis.**—This disease also chiefly affects women who have passed middle life, although it sometimes occurs comparatively early. It is much rarer than leucoplakia. The labia, nymphae, and the whole of the ostium vaginae, especially the vestibule and meatus urinarius, are affected, but there is no tendency to spread to the surrounding integument. In the early stages the whole vulva is reddened, numerous patches of dull red or purplish colour being seen upon it; in the later stages the affected parts are pale and greatly retracted, so that the entrance to the vagina may be extremely narrow. In the early stages the patient complains of irritation, with painful and frequent micturition and a discharge ; in the later stages there is no symptom except, it may be, dyspareunia, which results mechanically from the narrowing of the vaginal entrance.

In young women this condition may follow upon an artificial menopause due to removal of both ovaries.

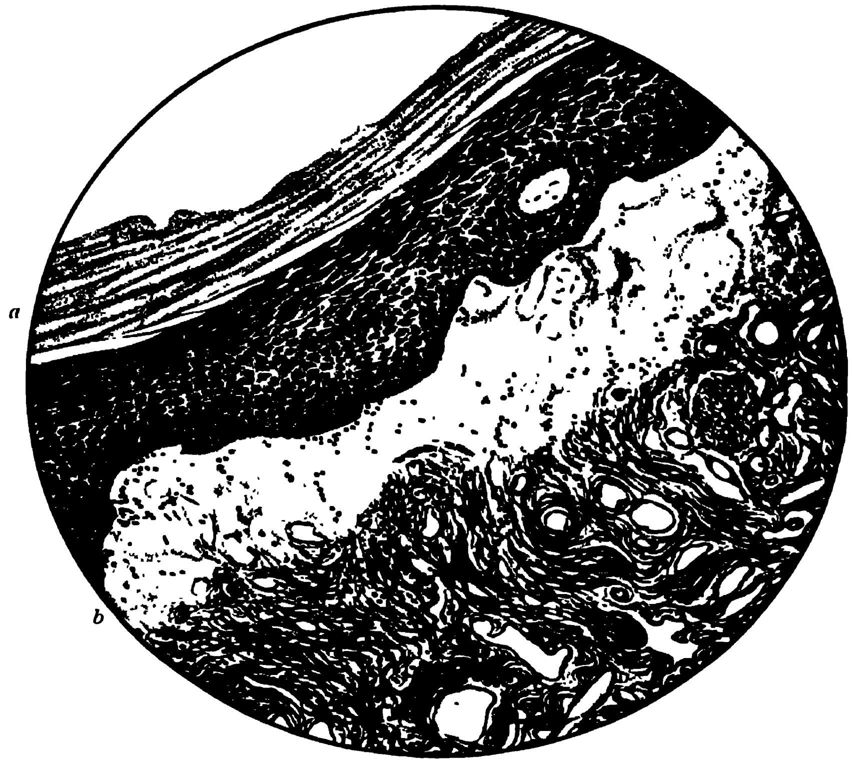

FIG. 217.—LEUCOPLAKIA VULVAE. *a*, The superficial squamous-celled layer shows excessive horny degeneration and desquamation ; *b*, the tissues immediately beneath the squamous-celled layer are degenerated, and appear practically structureless.

**Treatment of Pruritus.**—The possibility of an exciting cause, such as glycosuria or leucorrhœa, being present must first be considered ; if such conditions as these are overlooked, treatment will necessarily be unsuccessful. The next point to consider is the nature of the local changes in the skin, if such are present ; when none are found it is always very difficult to relieve the irritation. Cases of chronic eczema, and early cases of leucoplakia, can as a rule be greatly relieved, and in many cases entirely cured, by appropriate treatment. Advanced cases of leucoplakia are very obstinate, and usually require surgical treatment by excision of the affected areas of skin.

In regard to local treatment two preliminary points are of great importance, viz. that strict local cleanliness should be observed, and that scratching and rubbing should be avoided as far as possible. In a severe case the patient often scratches herself unconsciously when asleep, and at other times the irritation is so intense that the impulse to rub or scratch is almost irresistible. A hot hip bath, taken before retiring to bed, often brings a temporary relief, and as a means of local cleansing is a useful preliminary to the application of local remedies.

Of the numerous local remedies which have been made use of none can be recommended with confidence, for what succeeds in one case may fail in the next. In mild or early cases, or when no local changes are found, sedatives such as a 5 per cent. thymol or menthol ointment or lotion may succeed; or, failing these, a 5 per cent. to 10 per cent. cocaine ointment. Hot compresses wrung out of lead and opium lotion, or sprinkled with linimentum belladonnae, may also prove useful. In other cases strong antiseptic solutions are more successful, such as 1/1000 *biniodide* of mercury, which penetrates skin more readily than the perchloride; or 5 per cent. carbolic lotion freely applied exerts both an antiseptic and a local anæsthetic action. When the local changes are advanced, caustics strong enough to cause a certain amount of desquamation are often useful, such as pure liquefied carbolic acid painted freely over the affected parts under anæsthesia; a milder remedy of this class is a solution of nitrate of silver of 40 grains to the ounce, the application of which causes very little pain. In some instances the prolonged and careful use of a dilute mercurial ointment, one-half of the official strength, or the unguentum metallorum of hospital pharmacopœias, may be found of great service.

Treatment by local applications cannot be successful unless carefully and thoroughly applied by a nurse; the patient cannot do it for herself. First the affected parts should be cleansed, and then small strips of lint spread with the ointment or soaked in the lotion packed in between the labial folds and through the ostium vaginae, so that the affected surfaces are nowhere allowed to come in contact with one another.

Cases in which there are well-marked local changes, and which cannot be relieved by the above measures, may be treated by free excision of the affected areas of skin. This may involve removal of the nymphae and the clitoris with the inner portions of the greater labia. The vestibule and meatus urinarius must be preserved, and very little deformity results from this procedure, as the hair-bearing portions of the vulva are not sacrificed.

## ULCERATION OF THE VULVA

The following forms of ulceration may occur in the vulva: fissures, follicular ulcers, tuberculous ulcers, rodent ulcer, malignant ulcer, chancre, and tertiary syphilide.

*Fissures* occur chiefly in the vestibule and in the fossa navicularis; they are shallow linear ulcers, extremely sensitive and consequently causing great pain on coitus. They are readily curable by one or two applications of solid silver nitrate, or liquefied carbolic acid, the vulva at the same time being kept scrupulously clean.

*Follicular* ulcers occur in the hair-bearing skin of the labia majora and sometimes in other parts; they are multiple and occur in crops. They may be part of a general furunculosis, or may occur independently in the vulva. A papule first forms, which becomes vesicular, then pustular, and lastly forms a small round ulcer which may be of considerable depth. Sometimes the pustules dry up, and the scab does not separate until the underlying surface has healed. Considerable induration may form around the affected spots, giving rise to pain and tenderness. Dry boracic dressings externally and iron internally will usually arrest their production.

*Tuberculous* ulcers are rare in the vulva and occur chiefly in children affected by advanced tuberculous disease of the genito-urinary tract. They are indolent in type and show the characters associated with tuberculous ulceration in other parts. Microscopic examination will establish the diagnosis. Local treatment is seldom required owing to the presence of advanced tuberculous disease elsewhere.

*Rodent ulcer* is extremely rare in the vulva; ulceration due to a malignant new growth will be described below.

**Syphilis.**—In the vulva a *primary* chancre appears as a small papule, which in a few days breaks down, forming a shallow, cup-shaped ulcer with a dirty, greyish base. The amount of underlying induration, so characteristic of the primary sore in the other sex, is often slight, and sometimes absent altogether. The *local secondary* appearances are more obtrusive, condylomata being abundantly formed, and frequently associated with superficial ulceration in patches and a good deal of œdema of the surrounding tissues. The *constitutional* signs of syphilis are the same as in the other sex. *Tertiary* syphilitic ulceration of the labia is not very uncommon in prostitutes, and is usually associated with considerable thickening of the surrounding tissues. Sometimes the hypertrophic processes form so marked a feature that the condition has been regarded as elephantiasis with ulceration. The associated symptoms are irritation, discharge, and sometimes slight hæmorrhage. Constitutional treatment must be combined with removal of the hypertrophied areas of the vulva.

**Esthiomène or Genito-anal Scleroma.**—The name of esthiomène (εσθειν—to eat) was first applied by Huguier in 1849 to a form of chronic ulceration with nodular hypertrophy, which he had observed in the vulva; he regarded it as probably tuberculous in origin. Some later writers regarded it as a form of lupus, others as syphilitic, others as elephantiasis. It appears probable that under this designation have been grouped cases of varied kinds, some tuberculous, some syphilitic, others of chronic infective origin. Recent clinical observations from the Saint Lazare Hospital in Paris (Dupuy and Rullier) have shown, however, that a somewhat rare form of chronic ulceration of the vulva, neither syphilitic nor tuberculous in origin, exists, to which the name of esthiomène or scleroma may be accurately applied.

This disease finds its chief incidence in prostitutes of the

~~lowest-class~~, and appears to be due to uncleanliness, insobriety, and constant local irritation. The parts chiefly affected are the fourchette, the vestibule and meatus, the anus and rectum. The disease begins as an erythematous patch on the mucous membrane, to which succeeds a shallow indolent ulcer ; soon the base of the ulcer becomes indurated, and the induration spreads to the surrounding mucosa, tending especially to pass up the vaginal walls. Small nodular formations appear upon the edges of the ulcer and outside it, and these in time may become as large as a haricot bean or a nut. The ulcer tends to spread very gradually, but may remain stationary or may partially heal up at times. In long-standing cases the deformity produced by these lesions is extensive, the labia being covered with nodular masses ; sometimes the ulcerative process results in recto-vaginal fistulae, or in extensive destruction of the floor of the urethra. The indurated areas do not all ulcerate, some retract and become very dense, in this way producing stricture of the rectum or stenosis of the vulva. A purulent discharge is usually present. The ulcers are not painful and only slightly sensitive to the touch; they rarely bleed spontaneously and only slightly when touched or wiped. Consequently the disease causes no great inconvenience, and is often allowed to attain an advanced stage before relief is sought.

Surgical removal of the new formations or the ulcers is only possible when healthy tissues surround them through which the incisions can be made. Local medical treatment is of little use, and no drugs are known which are capable of curing or of arresting the disease.

## ELEPHANTIASIS

Elephantiasis of the vulva is rare in this country, although comparatively common in women of the dark races. A fair number of cases have, however, been recorded, some being referred by the authors to syphilis, others being instances of true elephantiasis arabum ; in some cases it is congenital (Ballantyne). An interesting example of true elephantiasis has been recorded by Maclean in which the disease affected the right buttock and lower limb as well as the vulva. The disease appears to begin in the labia minora, and pursues a very chronic course. In process of time large masses of

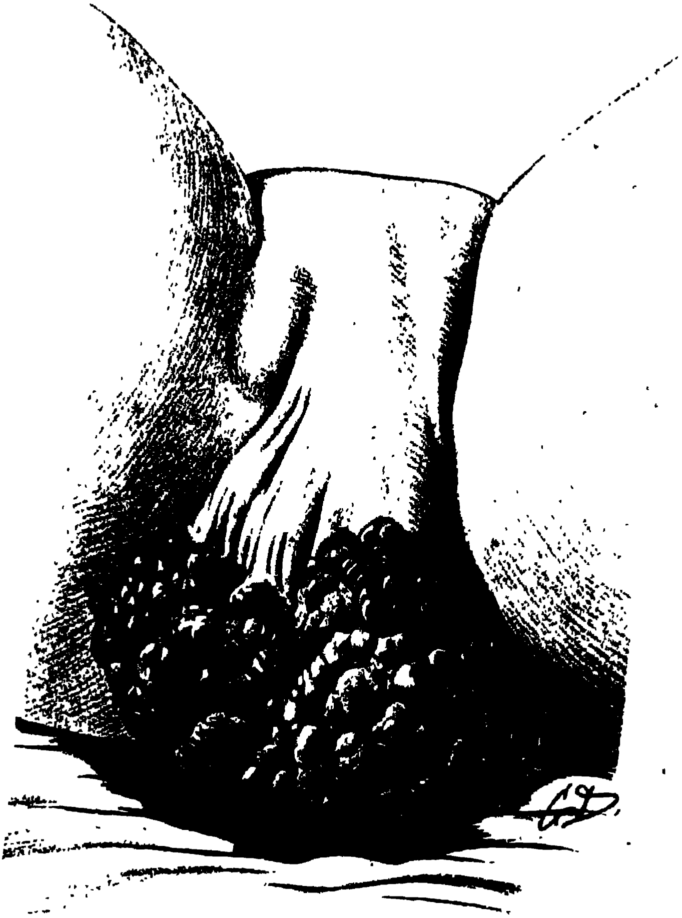

FIG. 218.—ELEPHANTIASIS OF THE VULVA (Maclean). A large pediculated mass of warty growth overhangs the vulva, being attached to the anterior part of the vulva in the neighbourhood of the clitoris.

nodular or warty growth, weighing several pounds, may be formed which, becoming pediculated, hang down between the thighs, and show a marked tendency to superficial ulceration (fig. 218). The warty form (*E. verrucosa*) is commoner than the smooth-walled form. The filaria may be non-existent in the blood even in cases of undoubted elephantiasis like that recorded by Maclean. Histologically the growth consists of fibrous tissue containing many dilated lymphatic spaces, and often undergoing myxomatous degeneration. Drugs have no effect upon this disease, but as surgical removal of the hypertrophied masses is usually practicable in the vulva the prognosis is more favourable than when the disease affects the lower limbs. Elephantiasis of the scrotum is relatively much more frequently observed than elephantiasis of the vulva.

## NEW GROWTHS OF THE VULVA

*Fibroma* is not uncommon. Beginning in the subcutaneous connective tissue, it usually grows outwards, becoming pediculated, and sometimes attaining an enormous size. The large tumours often become the seat of superficial ulcers due to venous stasis and friction. Usually they are firm and hard, but may undergo myxomatous or calcareous degeneration. They cause no symptoms except those due to their bulk, and they are easily removed by dividing the pedicle and tying the vessels it contains.

*Lipoma* is a rarer form of new growth than fibroma. It may occur in the greater labia either as a pediculated, an encapsuled, or a diffuse growth.

*Papillomata* frequently occur upon the skin surfaces in cases of chronic gonorrhœa. *Dermoid cysts* also occur, though very rarely.

**Malignant Growths.**—The following malignant growths may arise primarily in the vulva, their relative frequency being in the order stated: *squamous-celled cancer, melanoma, sarcoma, adeno-carcinoma.* Secondary growths are very rarely found in the vulva, with the single exception of cases of chorionepithelioma, in which this location has been observed with comparative frequency.

*Epithelioma* arises more often upon the labium majus than any other part of the vulva, and next in frequency come the vestibule and clitoris. It begins as a hard nodule in the skin which sometimes may attain the size of a small apple; usually the surface ulcerates and in some cases the destructive process predominates so that the growth appears in the form of a hard, raised ulcer with ragged edges. Bleeding is not severe, being usually only in the form of a sanious discharge. The inguinal glands of both sides become involved, even when the growth is not median in position. It attacks especially women who have passed the menopause,

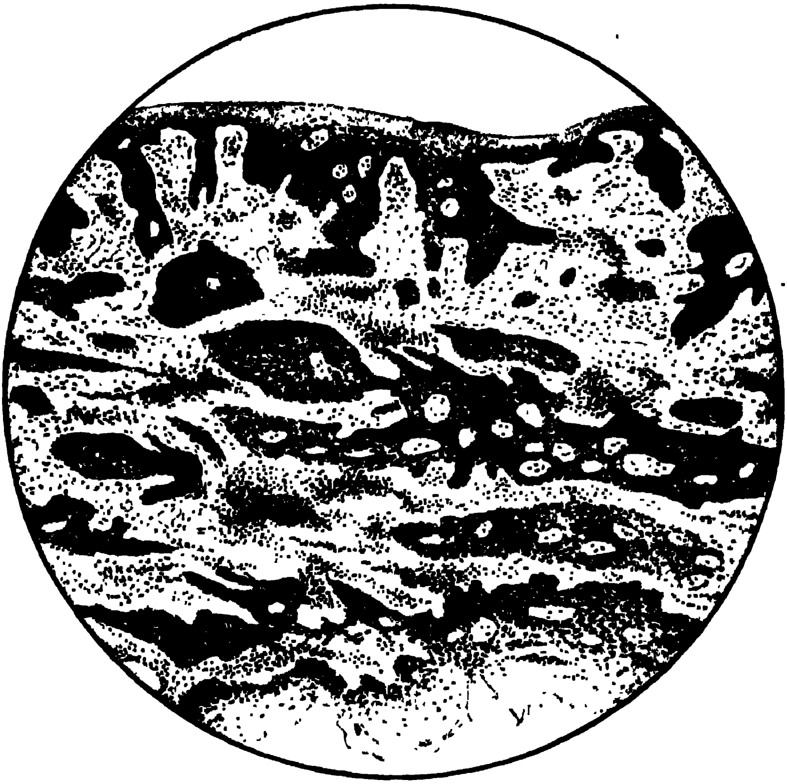

FIG. 219.—SQUAMOUS-CELLED CARCINOMA OF THE VULVA. The section is through the base of the labium minus. The subepithelial tissues are seen to be permeated by cancer processes arising from the deep epithelium.

the commonest decade being fifty to sixty years of age. It has to be distinguished from tubercle, syphilis, and esthiomène, a microscopic examination being required in doubtful cases. The histological characters are those common to skin cancer in other parts (fig. 219), the chief peculiarity being that there is a great abundance of epithelial pearls. The treatment consists in free and early excision of the growth. The inguinal glands on both sides should be removed, whether they are palpably enlarged or not, and a zone of one-third of an inch of healthy skin and subcutaneous tissue should be

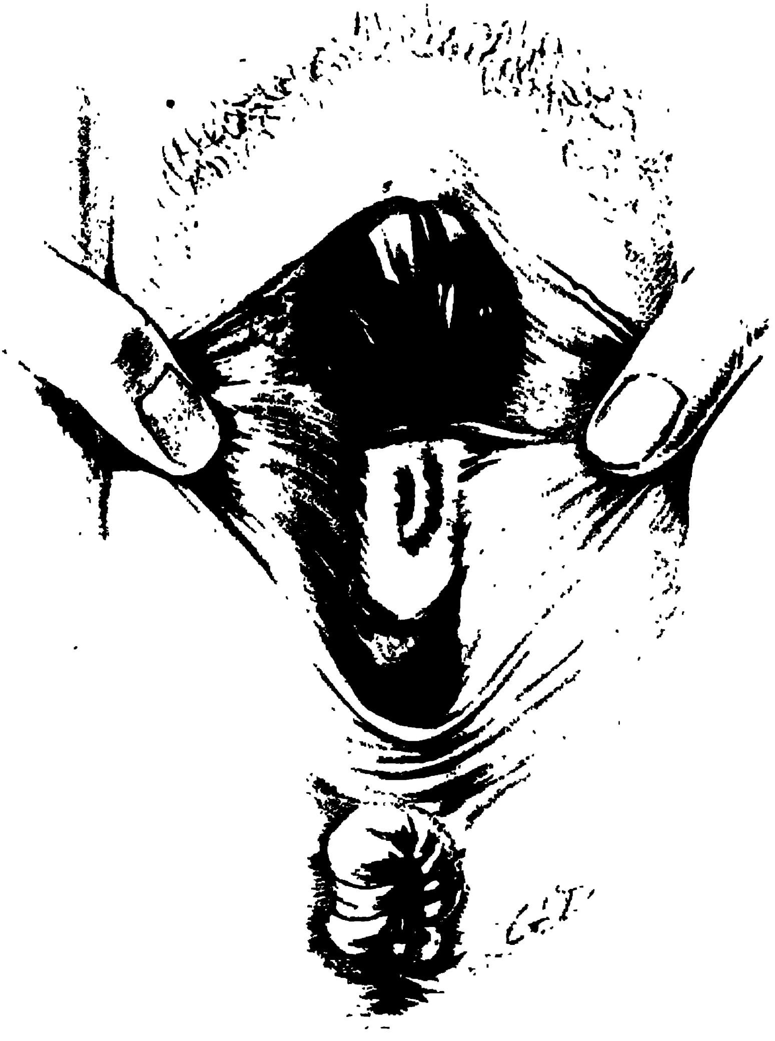

FIG. 220.—MALIGNANT MELANOMA OF THE VULVA (Eardley Holland). The growth has arisen in the vestibule, between the clitoris and the urinary meatus.

excised along with the growth, care being taken to cut as deeply as possible beneath it. When the growth is in the anterior part of the vulva, the entire lymphatic tract on both sides should be dissected out from the glands downwards, and removed along with the growth.

*Adeno-carcinoma* sometimes arises in Bartholin's gland; it is the rarest of all the malignant vulval growths.

*Melanoma,* a pigmented form of malignant disease, which occurs in the choroid coat of the eyeball and in pigmented areas of skin, is relatively frequent in the vulva. The abundance of pigment normally present in the skin of the vulva perhaps explains this frequency. It occurs in the form of a dark purple or black growth upon the skin, which seldom exceeds the size of a plum (fig. 220). It ulcerates early and bleeds more freely than epithelioma. The labia majora, clitoris, and labia minora are the most common points of origin. It especially affects elderly women, 70 per cent. of the recorded cases having occurred beyond the age of fifty (Holland). Early involvement of the inguinal glands is the rule in these cases. Histologically some are sarcomata, others carcinomata, in others it has been found difficult to decide whether the growth arose in epithelium or connective tissue. The pigment occurs in the form of golden brown granules which, when aggregated in masses, appear black; they occupy chiefly the cell bodies, but may also occur in the inter-cellular substance. According to Veit melanomata usually arise in pre-existing pigmented moles. The treatment is free excision along with the inguinal glands of both sides.

*Sarcoma* appears to be one of the rarest of the malignant tumours of the vulva; Blair Bell has recently succeeded in collating twenty-one cases of non-pigmented sarcoma from general literature, and this small number sufficiently indicates its rarity. It attacks the labium majus more frequently than other parts, and occurs at an earlier age than epithelioma and melanoma, 50 per cent. of the recorded cases having occurred between the ages of thirty and fifty. Histologically the growth may consist of spindle cells, round cells, or of both kinds, as is the case with sarcomata of other parts. Diagnosis is only possible with the help of the microscope, and the treatment is free and early removal. The prognosis as regards recurrence is bad.

## LABIAL HERNIA

Labial hernia in women is much less common than the corresponding affection (inguinal hernia) in the other sex; femoral hernia is the variety most frequently met with in women.

A labial hernia may contain a knuckle of bowel or a piece of omentum; in addition to, or instead of these structures, may be found an ovary, with or without its companion tube, a uterus alone, or a uterus with the adnexa of one or both sides. A few instances have been recorded in which a gravid uterus has been found in an inguinal hernia. It must be remembered that hydrocele of the processus vaginalis, or canal of Nuck, may closely simulate a labial hernia.

The treatment of these conditions is determined by surgical considerations alone, i.e. it must be appropriate to the size and position of the hernia, independent of the nature of its contents.

## BARTHOLIN'S GLAND

**Cysts.**—Both the duct and the gland itself may give rise to the formation of a cystic tumour. Cysts of the *duct* are true retention cysts due to stenosis of inflammatory origin, or more rarely to obstruction by a calculus. The resulting tumour is superficial and opens out the posterior third of the labium majus; it is seldom larger than a hen's egg, and is either oval or globular in shape (fig. 221). The deformity produced by it is fairly characteristic, the introitus vaginae being encroached upon, and the integumental coverings stretched tightly over the bulging tumour. The line of origin of the labium minus runs over the front of the swelling. Cysts of the *gland* are probably produced in the same manner, but are much less common than those of the duct. They lie deeply beneath the posterior part of the labium majus, and sometimes burrow upwards along the lateral vaginal wall and backwards into the ischio-rectal fossa. The integumental coverings are lax, and the deformity is less pronounced. The cyst can be grasped between the finger passed into the vagina, and the thumb placed externally, and its size and depth thus estimated.

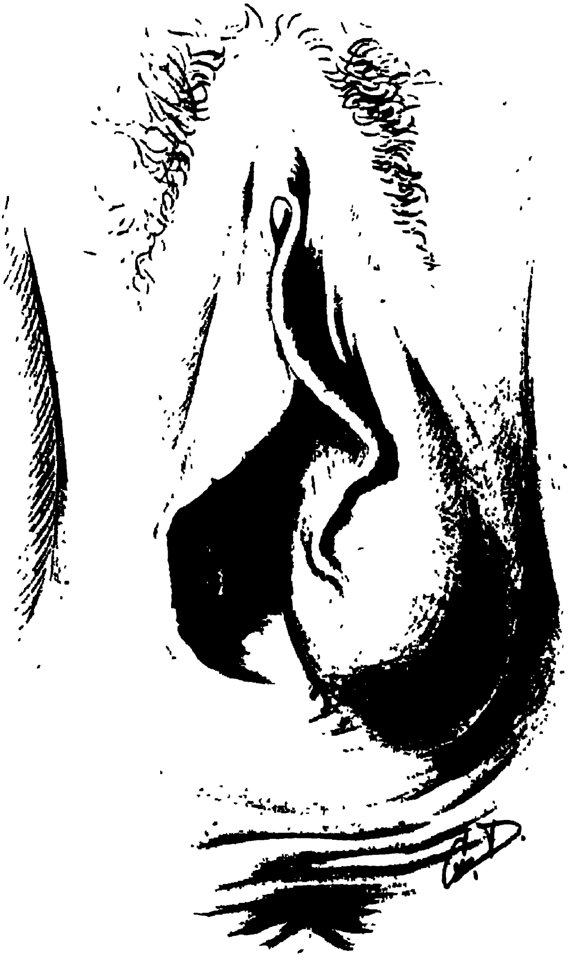

FIG. 221.—BARTHOLINIAN CYST, FORMED BY DILATION OF THE DUCT OF BARTHOLIN'S GLAND.

The fluid these cysts contain is usually thin and serous, but may be thick and coloured in long-standing cases. Little epithelium is to be found in cysts of the duct; those of the gland usually show patches of columnar epithelium and sometimes small glandular tubules.

The only *symptoms* associated with a Bartholinian cyst are mechanical in origin and slight in degree. Unless inflamed it causes no pain and is not sensitive when touched. It is, however, somewhat prone to become infected from vaginal discharges, or sometimes as the result of injury, and an *abscess* may then be the result.

*Treatment.*—Bartholinian cysts should be excised unopened if possible. An oval area of skin covering the most prominent part of the tumour may be removed with it, as the redundant and attenuated integument may slough from malnutrition after operation. The cyst will be found to pass deeply into the cellular tissue along the lateral vaginal wall, and in freeing it a vessel of considerable size—the artery to the bulb—is generally divided. The gland is usually taken along with the cyst and cannot always be identified. The cavity left after excision should be closed with one or two buried purse-string sutures of catgut, and the skin incision united separately with interrupted stitches. A small drain consisting of a couple of strands of silkworm gut may be left for twenty-four hours in the lower angle of the wound.

**Inflammation.**—The gland is not palpable when of normal size. When enlarged and indurated by chronic inflammatory processes it may be felt as a firm body of the size of a haricot bean or larger, lying deeply in the tissues beneath the posterior part of the labium majus. On pressure a turbid fluid may exude at the ducts. In gonorrhœal infection a definitely purulent discharge can often be demonstrated in the same manner, long after the vulvitis from which it originally arose has disappeared. When thus chronically infected a dull red zone of discoloration is usually seen around the mouths of the ducts, where they open on each side just behind the hymen (see p. 57). Cysts formed by obstructive dilatation of the duct may suppurate, being often infected before dilatation occurred. The suppuration is usually limited to the cyst, but may spread to the gland or to the surrounding cellular tissue, giving rise to a labial abscess.

An *abscess* may occur from acute infection of the gland itself, or of a pre-existing cyst ; usually the infection is gonorrhœal ;

in the case of a cyst, traumatism followed by septic infection from organisms in the skin or the vaginal secretions is sometimes the cause. Suppuration is usually limited to the gland or cyst, but widespread inflammatory swelling of the labia may accompany the process. Not infrequently spontaneous rupture of the abscess occurs externally, giving rise to a sinus which may be very persistent. The *symptoms* of suppuration are pain, rapid enlargement of the swelling, redness, œdema and tenderness of the integumentary coverings; a moderate rise of temperature to 100° or 101° is also usually present. The *treatment* is to lay the abscess freely open, break down any septa that may be felt with the finger, irrigate the cavity with an antiseptic solution, swab the walls with pure liquefied carbolic acid, and pack lightly with cyanide gauze. Chronic suppuration may sometimes be treated by complete excision, as in the case of a cyst, but, as a rule, the abscess is acute and primary union cannot be anticipated. The abscess cavity should afterwards be irrigated daily with peroxide of hydrogen and stuffed with gauze, so that healing may occur from the base upwards. Douching the vagina should also be practised for the removal of morbid secretions which might enter the granulating cavity.

## PERINEAL INJURIES

The anterior one-third of the perineal body is almost invariably lacerated to a certain extent in labour, the effect being to destroy the posterior commissure and fossa navicularis. In all considerable perineal lacerations the posterior vaginal wall is also involved, the tear here being usually lateral, and running upwards for an inch or more. In women who have had several children a similar tear is often found on each side. They persist in the form of sulci, which can be traced from the anterior edge of the perineum upwards and to one or other side, isolating the median portion of the vaginal wall, which often becomes prolapsed and its tissues thickened. Similar injuries may be found in cases where the perineal body is fairly well preserved. These vaginal lacerations destroy the supporting fibres of the levator ani and the vaginal sphincter, the result being that the ostium [illegible] relaxed and so distensible that three or four fingers can be passed into the vagina without inconvenience to the patient (see fig. 77). They are consequently important predisposing factors in the causation of prolapse. This relaxed condition of the vaginal introitus may exist without any greater injury to the perineal body than that mentioned above.

Frequently, however, damage more extensive than this is sustained by the perineal body, which may be lacerated up to, or even so as to include, the external sphincter ani muscle. Perineal lacerations may therefore be classified in three degrees: *first degree* involving only the anterior one-third; *second degree* involving the whole perineal body up to the anal sphincter; *third degree* involving the anterior portion of the sphincter itself. Lacerations of the second degree greatly enlarge and distort the ostium vaginae, but are not in all cases accompanied by prolapse, although the recto-vaginal septum is greatly attenuated. Those of the third degree produce a characteristic alteration in the appearance of the anus. Under normal conditions the pigmented perianal integument is thrown into shallow radiating folds by the persistent retraction of the circular sphincter muscle (fig. 214). When this muscle has been lacerated anteriorly the divided ends retract so that the muscle becomes crescentic or horseshoe-shaped instead of circular. A small shallow pit in the skin on each side can often be seen which indicates the position of the retracted end (fig. 257). Further, while the radiating folds persist laterally and posteriorly, they are lost anteriorly. The competence of the sphincter may be so much injured that a portion of the rectal mucosa becomes prolapsed in the form of a bright red sessile nodule, the size of a pea or even as large as a cherry. The grip of the sphincter upon the finger is always recognisably weakened. In slighter cases the patient may be conscious of weakness only when the bowels are relaxed, or when controlling the passage of flatus. In severe cases complete incompetence of the anus results.

The *treatment* of these injuries consists in repairing the perineum; this operation (perineorrhaphy) will be described on p. 587.

## THE URETHRA

**Urethral Caruncles.**—These small growths from the urinary meatus are of comparatively frequent occurrence. They rarely exceed the size of a pea, and are usually solitary and attached immediately within the posterior lip of the meatus. Some are sessile, rounded, pale red in colour, and only slightly sensitive to the touch; others are pediculated, bright red in colour, often lobulated, and in some cases, but not in all, extremely sensitive to the touch. The paler sessile growths are found on examination to consist of granulation tissue with a covering of stratified squamous epithelium, i.e. they are *granulomata.* They are often associated with a chronic urethral discharge, and probably result from chronic infection of the peri-urethral glands, which are especially numerous near the meatus. The bright red pediculated growths, on the other hand, vary considerably in structure; some contain glandular tissue, either in the form of crypts, tubules or spaces lined with epithelium, which appear to arise directly from the peri-urethral glands, i.e. they are *adenomatous.* The stroma consists of a delicate connective tissue often infiltrated with leucocytes, in which the vessels are always very numerous. Others contain large and numerous cavernous blood spaces in addition to the glandular elements, but these cannot strictly be called angiomatous. Others again are *papillomatous*, and present an irregularly broken surface, consisting of flat elevations with intervening sulci. The latter are lined with a thick layer of stratified epithelium of the transitional type common to the urinary passages. The epithelial covering is often lost upon the surfaces of the elevations (fig. 222). The adenomatous caruncles are sometimes very sensitive, but observers have not succeeded in detecting nerves in them.

The chief *symptoms* to which urethral caruncles give rise are painful and frequent micturition. Others cause such severe pain on micturition as to lead to retention of urine. Sometimes slight irregular hæmorrhage occurs from a caruncle, and sometimes the sensitive ones occasion dyspareunia. Many caruncles give rise to no symptoms whatever, and are discovered, if at all, by accident.

The *treatment* is excision, which should be fairly free, so as to remove the base of attachment; in the case of the sessile growths the base should also be seared with the actual cautery. Recurrence is not uncommon when methods less thorough than this have been adopted. Occasionally a growth at first regarded as a caruncle recurs and ultimately reveals the characters of epithelioma.

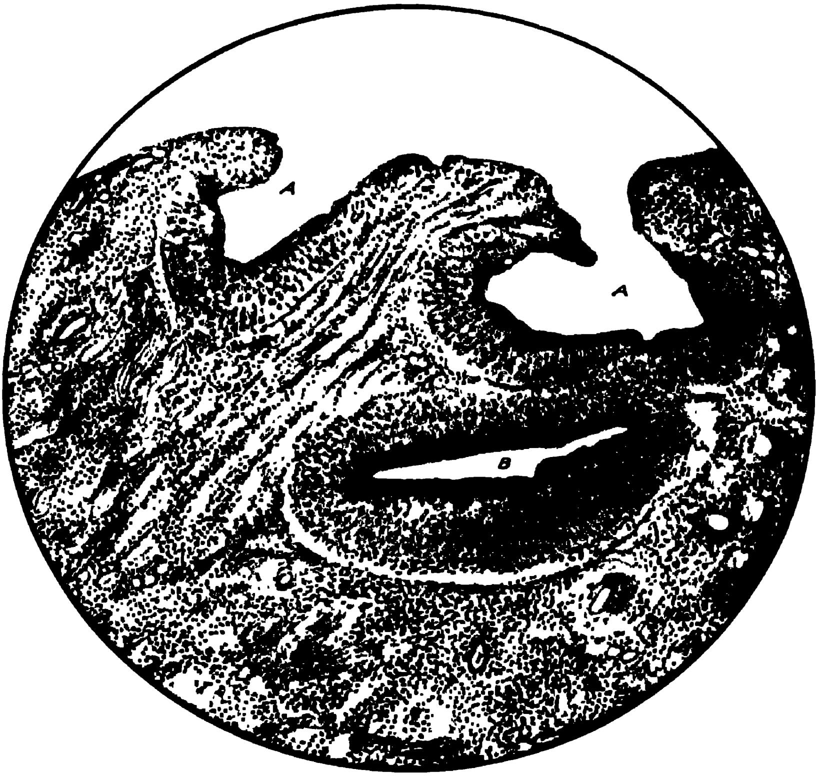

FIG. 222.—PAPILLOMATOUS FORM OF URETHRAL CARUNCLE. *A*, Surface depression lined with stratified transitional epithelium; *B*, a similar depression or crypt in transverse section. The stroma is very vascular, and infiltrated with leucocytes.

**Prolapse of the Urethral Mucous Membrane.**—In its slighter manifestations this condition may be confused with the sessile forms of urethral caruncle. A partial or complete ring of mucous membrane becomes everted through the meatus; its colour is deeper than that of the mucous membrane of the vestibule, and it overhangs the edges of the meatus. Its attachment all round to the margins of

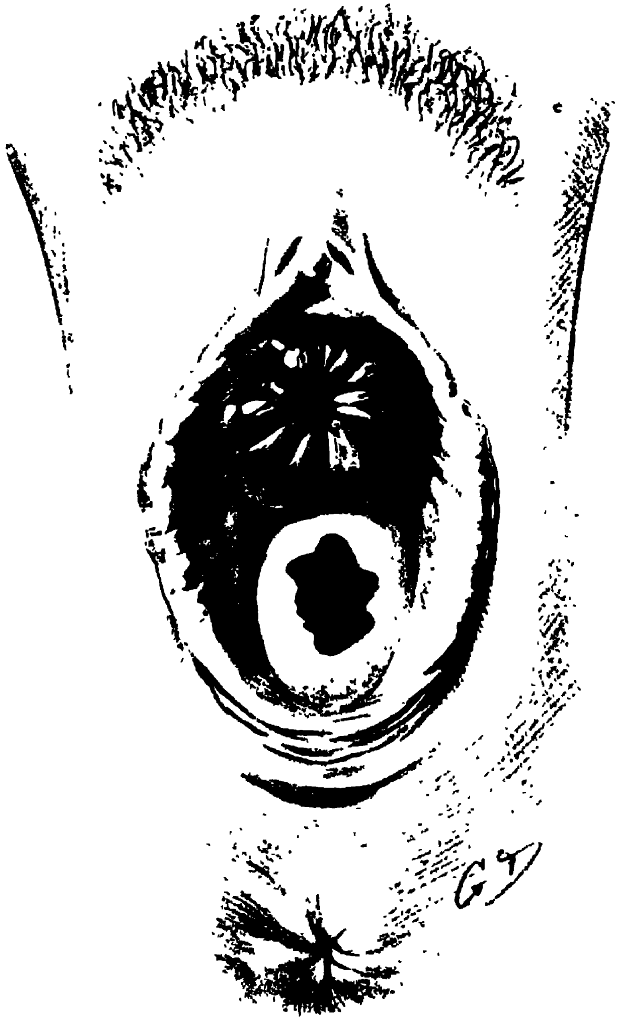

FIG. 223.—ACUTE PROLAPSE OF THE URETHRAL MUCOUS MEMBRANE (Arnold Lea).

this aperture can be readily demonstrated. It is usually accompanied by a certain amount of dilatation of the urethra, the patulous condition of the meatus probably being the determining cause. It may produce symptoms of irritability of the bladder similar to those met with in the non-sensitive urethral caruncles.

An *acute* form is sometimes met with in which a great part of the mucous membrane of the urethral canal becomes suddenly protruded through the meatus; the immediate cause appears to be straining at stool, the predisposing cause, dilatation of the urethra or prolapse of the anterior vaginal wall. The protruded mucous membrane becomes partially or completely strangulated, and forms a swelling which may be as large as a walnut (fig. 223). Its colour is deep red or nearly black, according to the degree of strangulation which has occurred; at the apex of the swelling a small aperture is to be seen through which urine slowly dribbles. This condition causes severe pain, dysuria, frequency or incontinence, and sometimes vesical tenesmus; the congested mucosa bleeds a little either spontaneously or whenever urine is passed.

The *treatment* of the acute form is to reduce it, if possible, under anæsthesia; this may, however, be impracticable, and if reduced the prolapse sometimes recurs. Excision of the prolapsed portion of the mucous membrane must then be practised, the edges being united to the lips of the meatus with fine catgut stitches.

**Carcinoma of the Urethra.**—This disease may be *secondary* to cancer of the vagina, the cervix, or the bladder, the urethra becoming involved by direct continuity.

*Primary* cancer is very rare in the female urethra, but Karaki, in 1908, collated twenty-three cases, and individual instances have been recorded by numerous writers. It affects elderly women who have passed the age of the menopause, and the symptoms to which it gives rise are so insidious that the disease has seldom been recognised until an advanced stage was reached. It begins either in the peri-urethral glands (columnar-celled cancer) or in the surface epithelium (squamous-celled cancer). The floor of the urethra is the part first attacked, and the growth rapidly spreads along the entire canal from the meatus to the bladder. The symptoms met with are pain on micturition, hæmaturia, and sometimes a blood-stained mucopurulent discharge. The inguinal glands may become involved, but in Karaki's series of cases this was only found in 20 per cent. The disease may spread over the vestibule and through the anterior vaginal wall, but shows little tendency to attack the bladder.

The *treatment* consists in free excision of the urethra and the inguinal glands on both sides. If a portion of the proximal end of the urethra can be saved it should be stitched to the anterior vaginal wall, but in such cases incontinence of urine usually results. If the sphincter of the bladder is injured or partially removed in the operation, the neck of the bladder should be closed and a permanent suprapubic fistula established.

# PART XI

## MALFORMATIONS

### MALFORMATIONS OF THE UTERUS AND VAGINA

The uterus is developed from the middle portions of the two Müllerian ducts, which fuse to form a single organ; the vagina is similarly developed from the hinder portions of these ducts (see p. 68). In very rare instances the formation of the Müllerian ducts is arrested at a very early period of the development of the embryo, so that the uterus and vagina are both absent, and the Fallopian tubes are only imperfectly represented. A more common error is non-fusion, or incomplete fusion of the ducts, or unequal development of the two halves of the embryonic uterus; the vagina usually participates in the abnormality. Lastly, after the uterus has been formed in the usual manner by fusion of the two ducts, its further development may be arrested either before its lumen has been completely formed (*uterus rudimentarius*), or before it has acquired the special character which appears at puberty (*uterus infantilis*) (see p. 27).

Six types of double uterus are known, which are diagrammatically represented in figs. 224 to 229. Each Müllerian duct may develop independently, and remain distinct from its fellow, fusion being completely absent; two uteri, independent of one another except at the cervico-vaginal insertion, result from this abnormality, the condition being called *uterus didelphys* (fig. 224). The vagina in such cases is always divided into two canals by a median septum, a normal cervix and external os being found in each. The vulva is single and, as a rule, there is only one hymen. The deep cleft which persists between the two uteri may allow of the clinical recognition of this type of double uterus on bimanual examination; each half is roughly cylindrical, the characteristic pear-shape of the properly developed organ being the result of fusion of the two ducts.

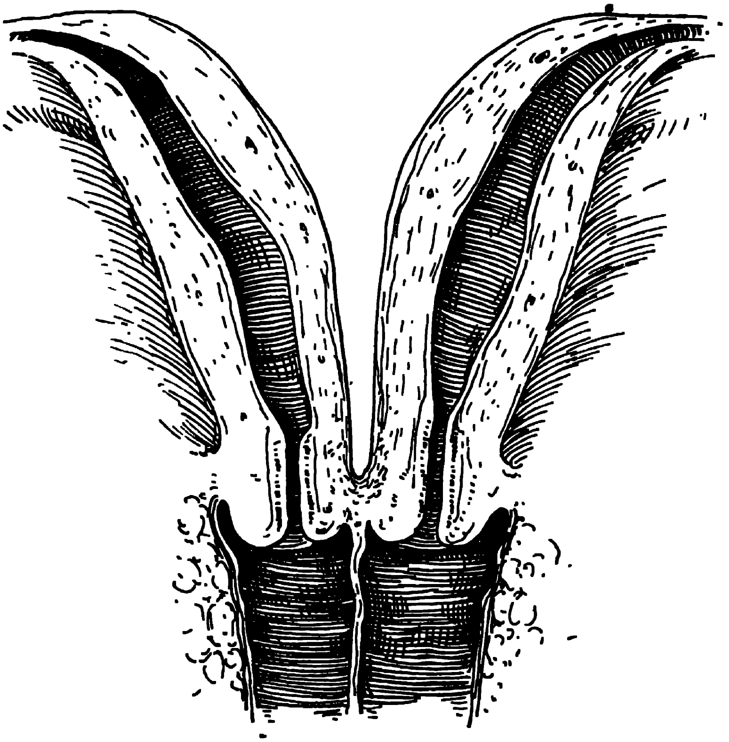

FIG. 224.—UTERUS DIDELPHYS. Two uteri are formed, separated from one another by a deep sulcus which passes down to the cervico-vaginal insertion. Two distinct vaginal canals are present, in each of which lies a complete cervix.

In other cases the upper parts of the uterine portions of the Müllerian ducts remain distinct, while the lower parts undergo imperfect fusion, so that the apposed walls unite while the lumina remain distinct. The cervix is single but divided by a median septum. This form is called the *uterus* *bicornis bicollis* (fig. 225), and differs in general outline from the uterus didelphys mainly in the lesser depth of the cleft between the two halves. Sometimes the process of fusion in the lower parts of the Müllerian ducts is carried a step further, an undivided cervix and vagina being formed, while from the level of the internal os upwards the uterine body is duplicated. On vaginal examination in such a case the cervix and vagina appear normal; the cleft between the uterine bodies is seldom so pronounced as to attract attention on bimanual examination; the presence of two divergent cavities may, however, be detected by the use of the sound. This form is the *uterus bicornis unicollis* (fig. 226).

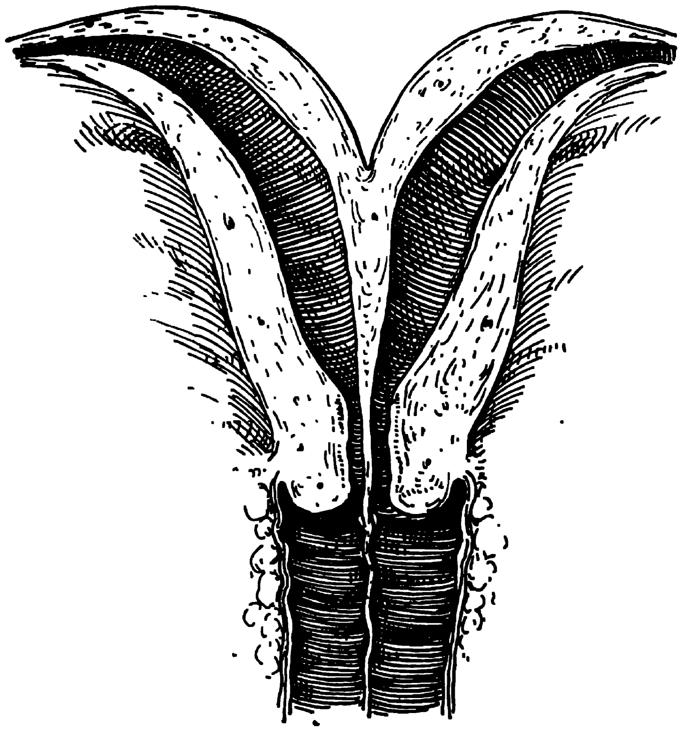

FIG. 225.—UTERUS BICORNIS BICOLLIS. Fusion has occurred in the cervix and lower part of the uterine body, but it is incomplete, for the lumina are distinct. The vagina is divided by a median septum which is prolonged up into the cervix.

In two other forms fusion has been carried to a point at which a single organ having the characteristic pear-shape of the uterus is formed, but the lumina remain wholly or partially separated from one another by a median septum; these are the *uterus septus* and the *uterus subseptus* (figs. 227 and 228). In the former the septum extends from the fundus to the os externum, and may also be continued into the vagina; in the latter the septum ends at, or about, the level of the os internum, the cervix and the vagina being single. There is nothing in the shape of the uterine body in these cases to draw attention to the abnormality.

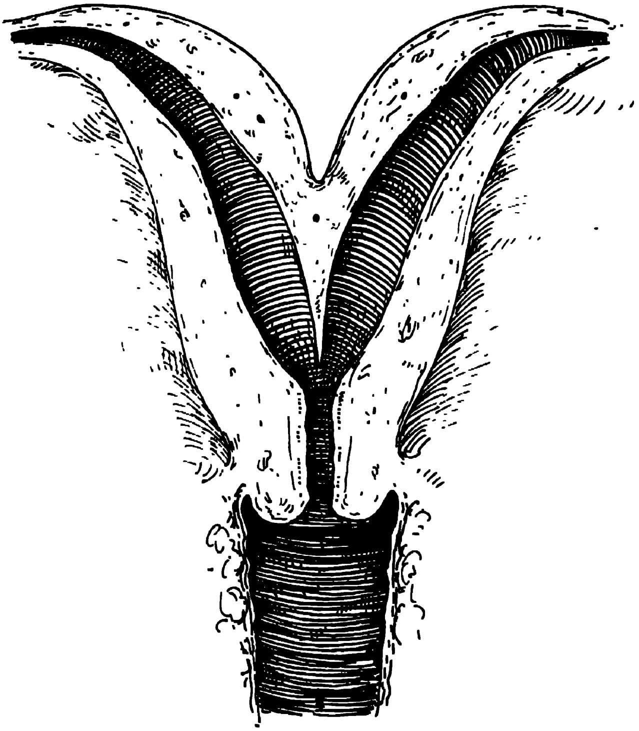

FIG. 226.—UTERUS BICORNIS UNICOLLIS. The cavity of the uterine body is double; that of the cervix and vagina is single. Complete fusion has occurred in the lower half of the uterus.

Lastly, one Müllerian duct may be entirely absent, when a tubular uterus having a strong lateral inclination is formed, *uterus unicornis*. More often, in such cases, however, a rudimentary condition of the opposite duct is found in the shape of a fibrous cord or band, usually only imperfectly canalised, which is attached to the side of the unicorn uterus (fig. 229). Sometimes in such cases the Fallopian tube itself on the side of the imperfection may be well developed; but the undeveloped horn in such cases rarely communicates with the uterine cavity. Such an imperfectly developed horn may become the seat of an ectopic pregnancy, the spermatozoa reaching it by migration from the opposite tube across the pouch of Douglas (external wandering).

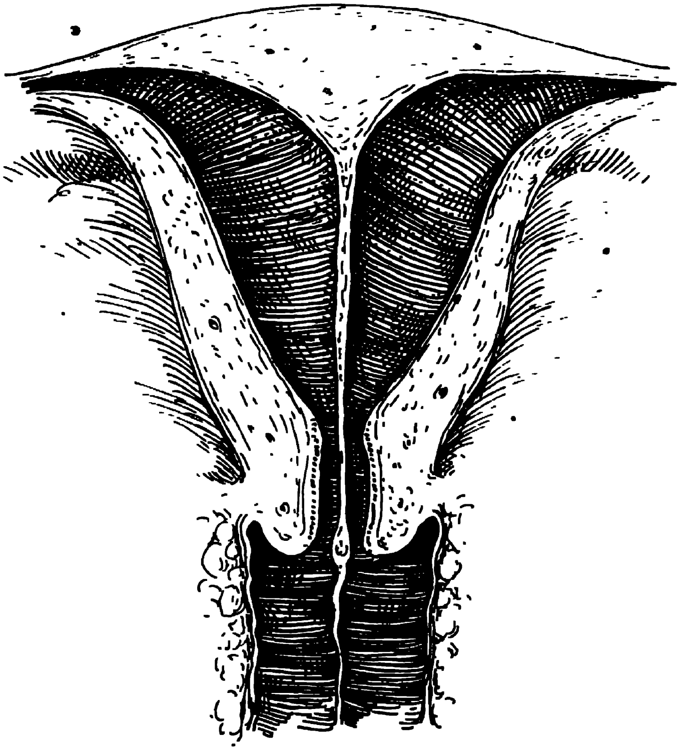

Fig. 227.—Uterus Septus. Incomplete fusion has occurred throughout and the outward configuration of the uterus is normal. The cavity is divided by a median septum which extends into the vagina.

*Double uteri*, though of great developmental interest, are of small clinical importance. They are functionally entire organs, and menstruation, conception, and labour may proceed normally as to arouse no suspicion of their imperfection. The Fallopian tubes and ovaries are usually normally developed. The condition is often first revealed by the accidental discovery during clinical examination of a doubl vagina. In married women one half of the vagina is usuall found dilated, the other in its virginal condition ; but sometimes both sides have been found dilated. Double uteri ar prone to the formation of fibroid tumours, just as norma uteri are, and many instances have been discovered in uter removed for these growths.

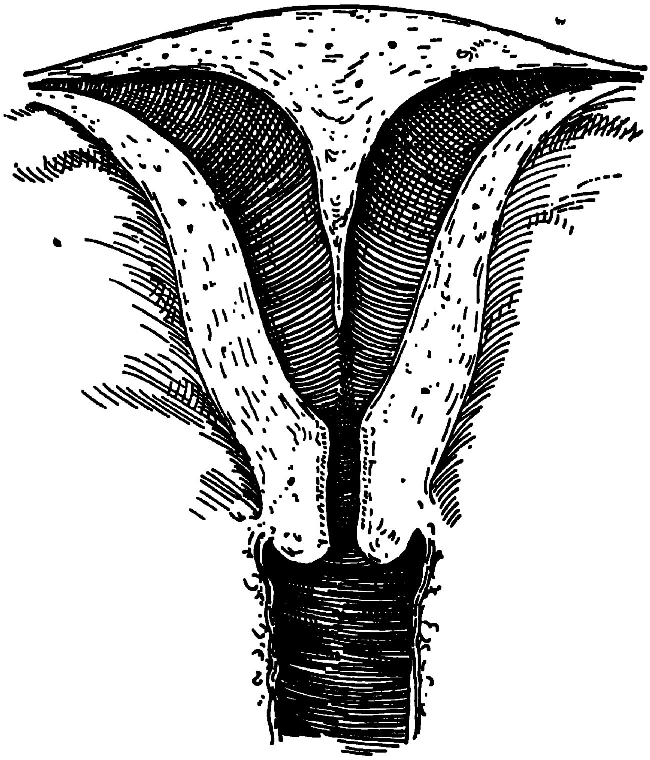

FIG. 228.—UTERUS SUBSEPTUS. This differs from fig. 227 only in respect of the septum, which ceases above the level of the internal os, the cervix and vagina being single.

Not infrequently one half of a double uterus or vagina may be also the seat of congenital stenosis, when retention of menstrual fluid occurs, and hæmatometra or hæmatocolpos will result (see p. 130). Such collections of blood may become infected and suppurate.

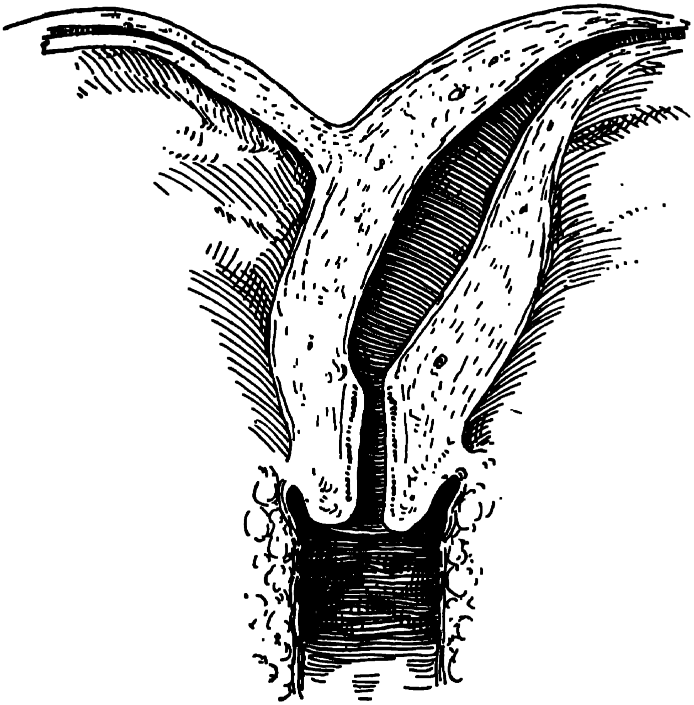

FIG. 229.—UTERUS UNICORNIS, WITH AN IMPERFECTLY DEVELOPED SECOND CORNU.

**Conical Cervix and Small Os Externum.**—In some cases the vaginal portion of the cervix instead of being cylindrical is smaller than normal, and shaped like an inverted cone, the os externum being upon the apex. This condition of the cervix is often associated with an anteflexed and undersized uterine body; clinically dysmenorrhœa and sterility are usually present in such cases. The abnormal shape and size of the cervix are of little direct importance, but they point to the co-existence of a general condition of imperfect uterine development.

The os externum is, as a rule, abnormally small in these cases and also in some instances where the vaginal portion of the cervix is otherwise normal. The abnormally small os is circular, and is often spoken of as the 'pin-hole' os; although its size exceeds that of a pin-prick, it is too small to admit the point of the uterine sound. Occasionally the internal os is also found to be abnormally small; as a rule, the point of the uterine sound will readily pass through it, but sometimes considerable difficulty is found, and the sound is tightly gripped in passing through this os. The relation of this condition to the production of dysmenorrhœa and sterility has been already referred to (p. 140).

## CONGENITAL ABNORMALITIES OF THE OVARIES AND FALLOPIAN TUBES

One ovary may be absent, and in cases of gross fœtal monstrosity such as *fœtus acardiacus* both may be wanting. Both conditions are very rare. The condition of the ovaries in hermaphroditism will be referred to below. The occurrence of a *supernumerary* (third) ovary has been frequently reported, but upon insufficient evidence. Winckel has, however, recorded a case which satisfies criticism, in which the supernumerary ovary lay in front of the broad ligament and was attached to the uterine cornu by a band resembling the normal ovarian ligament. The congenital abnormalities of the Fallopian tube consist of accessory ostia, diverticula, and accessory tubes; these conditions have been already mentioned (p. 32).

## HERMAPHRODITISM AND PSEUDOHERMAPHRODITISM

A *true hermaphrodite* is an individual who possesses the essential sexual glands of both sexes (ovary and testis); a *pseudohermaphrodite* is one who possesses sexual glands of one type only, associated with some of the minor organs of both sexes.

True hermaphroditism is an extremely rare condition in man, and although a considerable number of reputed cases have been recorded, the great majority fail to satisfy critical examination. Only two or three satisfactorily proved cases appear to be on record. One of these was recorded by Blacker and Lawrence in this country; it was that of an eight-and-a-half months' fœtus, in which were found on one side a uterus unicornis with an ovary and Fallopian tube, and on the other a combined gland (*ovo-testis*), with an enlarged Wolffian duct representing the epididymis and vas deferens, and a mal-developed Fallopian tube. The identity of these various parts was established by microscopic examination.

Pseudohermaphroditism is much more common, and many interesting instances are on record. When ovaries are present, the condition is called *female* pseudohermaphroditism; when testicles are present—*male* pseudohermaphroditism. The arrangement of the external genitalia is often very puzzling, and the sex of the individual can only be determined by exactly identifying the structure of the essential glands. Many errors of sex have been committed in these cases, and individuals educated as females have ultimately turned out to be males or *vice versâ*. Other malformations are often found in such cases which add to the difficulties of recognition. Thus in a male pseudohermaphrodite there may be non-descent of the testicles, bifurcation of the scrotum, and hypospadias, giving an arrangement not unlike the external genitals of the female type. In female pseudohermaphrodites, bilateral ovarian hernia has been found along with adhesion of the nymphae and hypertrophy of the clitoris, giving an arrangement generally resembling the male type. Errors of sex resulting from these conditions usually pass unrecognised until puberty; absence of menstruation, growth of hair on the face, and 'breaking' of the voice may then occur, and lead to the suspicion that a supposed girl may be a boy. The mistake is not always discovered at puberty, and instances have occurred in which a male pseudohermaphrodite has married and successfully played the rôle of wife, coitus occurring into a dilated urethra exposed by hypospadias. The secondary sexual characters appear to be somewhat unreliable, for males brought up as girls may show mammary development at puberty, and an irregular hæmorrhagic discharge from the urethra; it appears probable that the sexual environment and education of the individual may exercise considerable influence in the formation of habits and desires. Pseudohermaphrodites are always sterile.

# PART XII

# MAJOR GYNAECOLOGICAL OPERATIONS

## TECHNIQUE

Opening the peritoneal cavity by incision of the abdominal wall (abdominal section, laparotomy, coeliotomy) is the first step in the performance of a number of operations to be described in the succeeding pages. It will be convenient, and will serve to avoid repetition, if certain points in the technique and in the general management of all operations which involve a preliminary abdominal section are considered together.

**Preparation of the Patient.**—Except in surgical emergencies, at least twenty-four hours' rest in bed before operation should be insisted upon; this interval may be used for the examination of the urine, and of the lungs and circulatory system. In the case of patients of low vitality the administration of strychnine, either hypodermically or by the mouth, for several days before operation is of distinct prophylactic advantage in diminishing post-operative shock, and in enabling a prolonged period of anæsthesia to be supported. In the case of an operation which it is anticipated may be prolonged or severe, a hypodermic injection hyoscine and morphine (g.$\frac{1}{100}$ of the former and g.$\frac{1}{4}$ of the latter) may be given one hour before the operation. A comfortable drowsiness is thereby induced which obviates the extreme apprehension with which many nervous women await the commencement of an operation. Further, it diminishes the amount of anæsthetic which is required, reduces post-operative vomiting and pain, and in the author's experience has greatly reduced the frequency of anæsthetic bronchitis and pneumonia, the latter results being probably explained by the diminution which these drugs produce in the secretions of the respiratory mucous membranes.

A full dose of castor oil should be given at least twenty-four hours before the operation; the depression produced by free purgation will then have passed away before the operation is commenced. An enema should, however, always be given two or three hours before operation, and the bladder should be emptied by catheter immediately before administering the anæsthetic.

It is necessary to bear in mind the difficulties which may arise from oral sepsis in the after treatment of abdominal operations, for this condition increases the risks of prolonged vomiting and the difficulties of feeding. In the Hospital class of patients it is very common, and when operations of small urgency are proposed the previous removal of carious teeth and suppurating stumps is very desirable. Purulent or offensive discharges call for careful vaginal disinfection by douching, and plugging with antiseptic gauze.

The conventional view that abdominal operations upon the pelvic organs should not be performed during a menstrual period is a concession to sentiment and not the expression of a surgical necessity. The presence of menstruation does not in any way complicate the operative procedure or prejudice the convalescence; it is therefore unnecessary to postpone a proposed operation on account of the unexpected appearance of menstruation.

The *abdominal wall* should be prepared twelve hours before operation by shaving the pubes down to the level of the folds of the clitoris, and thoroughly cleansing with ether soap and water; special attention must be paid to the umbilicus. The difficulties of sterilising skin are well recognised, and some surgeons have abandoned the attempt to do so, relying solely upon aseptic cleansing of the abdominal wall; they regard antiseptic solutions as being ineffective for sterilisation, and objectionable from diminishing the vitality of the tissues. The majority of surgeons, however, are of opinion that the risks of skin suppuration cannot be met except by the use of antiseptics. The author's practice is, after the preliminary cleansing just described, to have the skin firmly rubbed with swabs soaked in ether in order to remove accumulations of fatty material from the glands, and then to swab freely with 1/40 carbolic acid solution, and cover the whole area with a compress soaked in the same solution, which is not removed until the operation is about to be begun. The whole abdominal area, including the groins and the flanks, should be dealt with in this way. The soap and ether stages may be repeated under the anæsthetic if thought necessary.

An alternative method of preparing the abdominal wall, which though but recently introduced has yielded good results, is, first to shave and cleanse the skin with soap and hot water, and then to paint the whole abdominal surface freely with a 2 per cent. watery solution of iodine, or with tincture of iodine, twelve hours before the operation. A sterile dressing is applied and the painting of iodine repeated after the patient has been anæsthetised.

**Swabs and Compresses.**—These should be made of gauze or gamgee tissue, which is now almost universally used instead of marine sponges. Two large compresses (ten inches to twelve inches square), or several loosely rolled pieces of gauze six yards long and four to six inches wide, are required for packing, i.e. for isolating the pelvic area from the upper abdomen and its contents. For taking up blood and for general cleansing it is best to provide a large number of smaller gauze swabs three to four inches square. All can be used either dry, or soaked in warm, sterile, saline solution, and discarded when soiled. They must be carefully counted before and after the operation, and for this duty the operator is personally responsible. Supplies of swabs, dressings, towels, aprons, etc., sterilised by steam under high pressure, and preserved in hermetically sealed tins, can now be obtained from surgical instrument makers, and may be used with confidence when supplied by firms of repute.

**Instruments and Ligatures.**—Instruments should be boiled for at least ten minutes immediately before the operation; sharp instruments may be immersed in 1 in 20 carbolic solution for a quarter of an hour, instead of boiling, which blunts them. If silk ligatures are employed, the silk should be *boiled for an hour* before use; a second boiling for ten minutes immediately before the operation is also desirable. Catgut may be obtained sterilised from instrument makers, or it may be sterilised conveniently by the operator, by soaking it for ten days in a one per cent. aqueous solution of iodine.

*This may be relied upon to sterilise the gut, but it is not desirable to keep catgut in this solution for more than three or four* weeks, as it becomes brittle. Fresh supplies are therefore desirable. Catgut which is required to resist absorption by the tissues for more than four or five days, as when used to unite fascial structures, should be treated with chromic acid or formalin before being passed through iodine. It is desirable to work with ligatures as fine as possible consistently with good hæmostasis. Number four or five silk is quite strong enough when properly treated to hold a thick ovarian pedicle.

**General Conduct of the Operation.**—The *anæsthetic* most suitable for prolonged intra-peritoneal manipulations is chloroform; after dividing the abdominal parietes only light anæsthesia is required, except when exerting traction on the pedicle of a tumour, or on structures which are adherent. When a general anæsthetic is contra-indicated by the presence of serious cardiac or pulmonary complications, local anæsthesia may be employed for short and simple operations, such as the removal of a non-adherent ovarian cyst. Schleich's method of *intra-cutaneous* injection of a sterile saline solution containing cocaine and morphine is very useful;[1] or a weak solution of cocaine (½ per cent.) alone may be used as a *subcutaneous* injection, about one drachm of this solution being gradually introduced beneath the site of the proposed incision. Lumbar anæsthesia has also been extensively employed for operations of comparatively short duration, i.e. up to half an hour. The use of the Trendelenberg position when anæsthetic solutions are to be injected into the spinal canal demands great care, for the extension of paralysis to the motor nerves arising from the cervical portion of the cord may be attended with serious consequences.

It is of great importance that the atmosphere of the room in which the operation is performed should be warm, the temperature being at least 70° F. Exposure of the body, or of the abdominal viscera, to a lower temperature than this causes severe shock.

For all operations on the pelvic organs the inclined or Trendelenberg position is of great assistance; it allows of the intestines being withdrawn from the operation area, and kept out of the way; and further, by raising the pelvis, it brings the contents of this cavity into easier reach. In the case of stout persons it somewhat embarrasses the action of the diaphragm and so impedes aeration of the blood, with the result that marked cyanosis supervenes, but this condition when carefully watched is not of serious moment.

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[1] The formula is: Morphinæ sulphat. gr. $\frac{1}{10}$, cocainæ hydrochlor. gr. $\frac{1}{8}$, saline solution 0·5 per cent. ℥j. The injection is made with a fine needle into, not beneath, the skin.

The *incision* which is most generally useful is the median supra-pubic incision through the linea alba; this gives better access to the pelvic cavity than any other. The lower end should extend down to the pubic bone, due care being exercised in avoiding the bladder; freer access is thus given to the pelvic cavity than when the incision is placed higher up. Occasionally an incision through the linea semilunaris or the rectus muscle will give more convenient access as when, for example, the right adnexa and the vermiform appendix are at fault. The transverse incision of Küstner may be used when comparatively small space is required, as in operations for ventral fixation of the uterus. This incision divides the integument transversely about one and a half inches above the pubes; the skin edges are then retracted up and down, and the fascia, muscle, and peritoneum are divided in the mesial plane. The resulting skin cicatrix is concealed by the pubic hair, and the abdominal cicatrix gains in strength from the fact that the different layers are divided in planes which cross at a right angle. But the amount of room furnished by this incision is very limited.

The *sterilisation of the hands* of all persons actually engaged in the operation is an important detail which demands the personal attention of the operator. The difficulty of effectively sterilising skin has been already referred to; an indirect consequence of this difficulty is seen in the great divergence of view which prevails as to the best method of overcoming it. The following method, which has been subjected to repeated bacteriological tests by different observers, may be confidently recommended: (1) the nails must be short and the skin of the hands intact; (2) the hands and forearms should be scrubbed with a freshly boiled nail brush, in hot water and soap, for at least five minutes; ether soap or turpentine may be employed at this stage as solvents of fatty matter; (3) after removing the soap with fresh water, the hands and forearms should be immersed in a watery solution of 1/1000 biniodide of mercury for two or three minutes, and then rubbed over with a swab soaked in another solution of biniodide of mercury in diluted alcohol (75 per cent.), the proportion of biniodide being 1/500; (4) the hands thus sterilised should be immediately covered with rubber gloves sterilised by boiling for five minutes; the gloves can be most conveniently put on by filling them with boiled water or a weak solution of biniodide of mercury. Biniodide is preferred to perchloride of mercury as being a more powerful germicide, and as penetrating skin more readily owing to its not coagulating albumen, as is the case with the perchloride. The wearing of gloves does not obviate the necessity of careful sterilisation of the hands, for gloves are sometimes punctured or torn during the operation.

Sterilised gowns or blouses, and a covering for the head which completely covers the hair, the nose, and the mouth, leaving the eyes alone free, should be worn by the operator and his assistants.

All intra-peritoneal manipulations must be conducted with the most scrupulous aseptic care; viscera should be handled gently, and the area of the manipulations should be kept within the narrowest possible limits. Except under quite exceptional circumstances, antiseptic solutions should not be allowed to enter the peritoneal cavity. The amount of blood lost should be carefully controlled as far as is possible; the work should be rapidly and gently carried out; the number of assistants employed should be the fewest possible.

Drainage is generally unnecessary except when the peritoneum has been soiled with pus, with bowel contents, or with the contents of an apparently infected cystic tumour. Vaginal drainage, in infective cases, is the method of choice, and may be carried out by cutting down from above upon a pair of forceps passed by an assistant into the posterior vaginal fornix; some operators prefer to open the fornix by posterior colpotomy (see p. 599) after closing the abdominal wound. A rubber tube passed into the vagina from above may be employed. Sometimes it may be advisable to employ a supra-pubic drain as well, but the mechanical advantages of the vaginal route in allowing the free escape of fluids will be sufficiently obvious. Occasionally it is desirable to drain in non-infected cases, as when oozing cannot be completely controlled, or when the re-accumulation of ascitic fluid is anticipated, as in the case of papilliferous cysts and tumours of the ovary. A supra-pubic drain consisting of a rubber tube through which a wick of gauze has been passed may then be employed.

Flushing the peritoneal cavity is generally undesirable; when pus has escaped it should be carefully wiped away without delay, and if the area of contamination is strictly limited the peritoneal membrane, aided by free drainage, may be relied upon to deal with what remains. It is usually also inadvisable to attempt to disinfect contaminated areas of peritoneum with antiseptics, for these substances do harm by destroying the vitality of the endothelium.

Before the abdomen is closed the operator must satisfy himself that all swabs, forceps, needles, etc., which have been in use during the operation are accounted for; foreign bodies such as these have frequently been left in the peritoneal cavity, and no accident more dangerous to the patient during convalescence than this can occur.

The parietal incision should be sewed up in layers; continuous catgut sutures may be used, a fine one for the peritoneum and one somewhat stouter for the fascia; the skin and subcutaneous tissues may then be united by a continuous silk suture, or by interrupted stitches of silk or silkworm gut. When the layer of fat is of more than average thickness, a buried catgut stitch may also be used to bring the deeper parts of this layer together, or two to three additional deep interrupted stitches may be introduced which will embrace all the tissues between skin and fascia. Many operators prefer to unite the skin with a fine *subcutaneous* silk ligature, which leaves no needle marks, or with Michel's clamps. These methods give a less conspicuous cicatrix than when stitches are used.

The wound dressings should be dry, absorbent, and aseptic; they must be retained firmly in position by a tight binder, the most convenient pattern being the 'many-tail.' When no drain is used, a collodion scab may be applied along the line of stitches which effectively excludes air from the wound.

## PREPARATIONS FOR A VAGINAL OPERATION

The general preparations already detailed as necessary in abdominal operations may also be applied in cases of vaginal operations. It is of especial importance in such procedures as perineorrhaphy that the rectum should be thoroughly emptied, and it is therefore desirable to give the principal aperient (which should be castor oil) about forty-eight hours before the operation. A mild saline such as a seidlitz powder may then be given twenty-four hours before the operation and followed by at least two rectal enemata, the last being administered two or three hours before the operation. These precautions are required to prevent soiling of the field of operation by escape of fæces under anæsthesia.

The sterilisation of the field of operation presents unusual difficulties in the case of the vulva and vagina; the labia and pubes should be shaved, and the integument treated in the same manner as the abdominal wall (see p. 534). The iodine method of preparation yields good results in cases of perineorrhaphy. The vagina cannot be effectively disinfected by douching, although the use of large quantities of antiseptic solution is of undoubted assistance. It must, however, in all cases be completed by the operator under anæsthesia, when the vaginal walls can be thoroughly and systematically scrubbed with an efficient antiseptic such as 1/1000 biniodide of mercury or ʒi to Oi of lysol. The mercurial solution is the more powerful antiseptic of the two, but has the disadvantage of roughening the surface of the mucous membrane, while the lysol solution renders it supple and slippery, and so facilitates operative manipulations. It is undesirable to perform plastic operations during menstruation, or when unhealthy vaginal or uterine discharges are present, owing to the increased difficulty of securing primary union under such circumstances.

Rubber gloves should be worn by the operator and his assistants in all vaginal operations which involve the opening of the peritoneal cavity, and in all plastic operations. Instruments and ligatures should be dealt with as for an abdominal operation. The most convenient position for a vaginal operation is the modified lithotomy position, the thighs being well flexed and the feet supported upon uprights fixed to the operating table, or the knees slung in a Clover's crutch.

## OVARIOTOMY

This name is applied, by time-honoured custom, to the operation for the removal of an ovarian tumour. The essential steps in this simple operation are the delivery of the tumour through the incision, the division of the pedicle, and the control of hæmorrhage.

Tumours of small size can be turned out of the abdomen entire through a median incision of four to five inches in length; the pedicle can then be examined and secured under direct observation. Should the tumour have contracted adhesions to its surroundings, these must be divided and the growth must be completely liberated, so that the pedicle may be defined, before anything further is done. Cystic tumours too large to be turned out through an incision of this extent may be first reduced in size by tapping if the following conditions are complied with: (1) there is a large loculus in the cyst containing a considerable amount of fluid; large tumours composed of an aggregation of small loculi cannot be tapped; (2) the pedicle is not twisted or the tumour extensively adherent—conditions under which the contents may have been infected; (3) there is no clinical condition which raises a suspicion of malignancy. If these conditions are not complied with, an incision must be made large enough to allow of the complete eventration of the tumour, for the reason that the escape of ovarian fluid into the peritoneal cavity, which is difficult to avoid completely during tapping, may be followed by serious results. When, however, the conditions are favourable, tapping is desirable as facilitating the removal of the tumour, and avoiding the disadvantages attending a very long abdominal incision. For tapping, an ovariotomy trochar, similar to that shown in fig. 230, should be used; the escaping fluid can be led away through a rubber tube attached to the end of the trochar. When the collapsed tumour has been drawn out of the abdomen, the pedicle is clamped with two or three pairs of artery *forceps and then divided between the clamps and the* tumour.

When long and thin, the pedicle may be transfixed with a blunt needle midway between the uterus and the infundibulo-pelvic fold, and secured with a ligature tied at each side, the outer embracing the ovarian vessels, the inner the ovarian ligament and Fallopian tube. The best ligature for the purpose is number four or five silk. A thick broad pedicle should, however, be secured in sections, which can be transfixed and tied off as the clamps are removed. Special attention should then be paid to the ovarian ligament, which must be understitched separately ; it retracts considerably when divided, and as a vessel of considerable size, the anastomatic branch of the uterine artery, accompanies it, dangerous hæmorrhage may occur from slipping of the ligature (see fig. 40). Securing the pedicle in sections is preferable to embracing a considerable thickness of tissue with stout ligatures, for it gives more secure control of hæmorrhage, and does not strangulate the included tissues, or limit the future mobility of the uterus. The ovary of the opposite side should be carefully examined before the abdominal incision is closed, for in many cases a second smaller tumour is found, the existence of which was previously unsuspected.

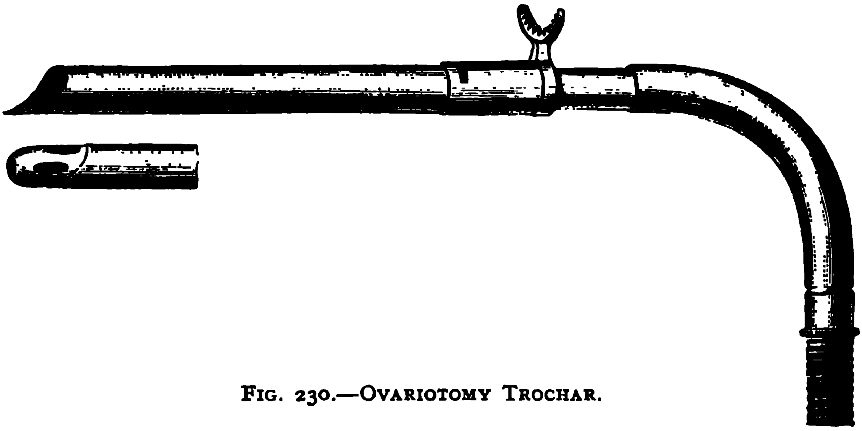

Fig. 230.—Ovariotomy Trochar.

Parovarian cysts are contained between the layers of the broad ligament, and are generally sessile, although the formation of a pedicle is not impossible. Sometimes they burrow deeply beneath the peritoneum lining the pouch of Douglas, or the lateral pelvic regions. Pediculated par-ovarian cysts may be dealt with in the manner just described. When sessile, the peritoneum covering the summit of the tumour must be incised transversely, i.e. from the uterine border outwards, and the cyst carefully enucleated through the connective tissue layer of its capsule. As these cysts usually possess thin and delicate walls, they are often ruptured during enucleation. The redundant portion of the capsule can be cut away, and after all oozing from the bed of the tumour has been controlled, its walls can be drawn together with a buried purse string suture and the peritoneal edges closed over it. Large cavities, or those in which oozing persists, should be drained *per vaginam*, by an incision through the posterior fornix large enough to carry a small rubber tube or a strip of gauze. The peritoneum can then be closed over the drain, and the abdominal incision completely united. This gives more efficient drainage than the supra-pubic method.

## OPERATIONS ON THE UTERINE ADNEXA

The following conditions may necessitate the partial or complete removal of the Fallopian tubes, or of the ovaries, or of both tubes and ovaries :

1. Pyosalpinx, or ovarian abscess, or both.
2. Non-suppurative inflammation, including hydrosalpinx and cystic disease of the ovaries.
3. New growths of the tubes or ovaries.
4. Extra-uterine gestation.

When both the tube and its companion ovary are removed the operation is known as *salpingo-oöphorectomy* ; it may be unilateral or bilateral. In removing an ovarian tumour, the corresponding tube is also removed, as it forms a part of the pedicle. There is, further, no advantage in retaining the tube after the ovary has been removed. Removal of the tube alone, or of the ovary alone, is known as *salpingectomy* or *oöphorectomy* respectively. When a portion only of the ovary is removed it is called *resection*. The construction of an artificial abdominal ostium in the outer portion of the tube is called *salpingostomy*.

### Salpingo-oöphorectomy

(A) *In Suppurative Cases.*—Suppuration in the uterine adnexa may occur as an acute or as a chronic affection. In all probability it necessarily involves permanent loss of function on the part of tube; in the case of the ovary, an abscess may form without of necessity completely destroying the whole of the ovarian tissue. Practically speaking, however, an ovary, which is the seat of suppuration, cannot be dealt with on conservative lines, but must be entirely removed. Small peritonitic collections of pus are often found in the neighbourhood of a pyosalpinx or an ovarian abscess.

In *acute* cases accompanied by well-marked fever and constitutional disturbance, or by signs of infection spreading upwards to the general peritoneal cavity, abdominal operations are attended by very grave risks; such collections of pus in the pelvis should be dealt with in the first place by vaginal incision and drainage (see posterior colpotomy, p. 599). In *chronic* cases the abdominal route is preferable, for if the extirpation of the affected organs is necessary, this is more safely and readily carried out from above than from below. In such cases the pus will often be found sterile. Further, the dense adhesions formed under these circumstances render the isolation of the adnexa difficult, and as coils of intestine are frequently involved, there is considerable risk of injuring the bowel. This risk can best be avoided by obtaining free access to the parts and working under direct observation.

The separation of adhesions in suppurative cases requires careful and delicate manipulation. Omental adhesions are usually first encountered. These may be separated, or the adherent portion of omentum may be cut away and secured with ligatures. Bowel adhesions should next be dealt with. As far as possible each part should be seen as well as felt, and in dealing with adherent structures in the pelvis, the proper exposure of the parts is facilitated by the use of a double-bladed retractor such as that shown in fig. 231, which will mechanically hold the edges of the wound widely apart. Lightly adherent coils of intestine should be gently peeled off with a swab; firm bands of intestinal adhesion should, however, be divided with blunt-pointed scissors, as far as possible from the wall of the bowel. The peritoneal coat of the adherent intestine is frequently damaged during separation, and in difficult cases the bowel may be actually opened. All such injuries must be immediately repaired.

When the affected tubes and ovaries have been completely freed from bowel adhesions they have still to be separated from the floor of the pouch of Douglas, the back of the uterus, and the back of the broad ligament; they can then be drawn up into the wound and inspected. When in this way the pedicle has been defined it is often found considerably thickened by inflammatory changes; ligature in bulk of such a pedicle is undesirable; it should be clamped in three sections, and the appendages cut away before the ligatures are passed (fig. 231). The outer ligature includes the ovarian vessels; of the two inner ligatures, one embraces the uterine end of the tube, the other the ovarian ligament and its accompanying vessel (see fig. 232). A separate ligature is desirable for the latter structure, as it contains a good deal of muscular tissue which retracts, and it is usually accompanied by an artery of considerable size. The fourth ligature shown in the figure is not required unless the pedicle is long or thick. If the uterine end of the tube is much thickened it should be excised along with a wedge-shaped piece of the uterine cornu, the gap thus left in the uterus being closed with a couple of stitches. This will obviate the risk of subsequent trouble arising from the stump of the infected tube.

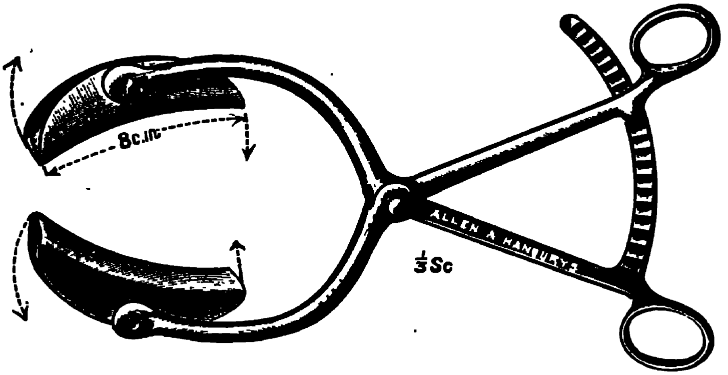

FIG. 231.—POZZI'S ABDOMINAL RETRACTOR. The blades can be widely separated by approximating the handles.

If the disease is bilateral and the uterus is to be removed as well, only the outer section of the broad ligament need be tied, the procedure being similar to that to be described later as supra-vaginal hysterectomy (p. 549).

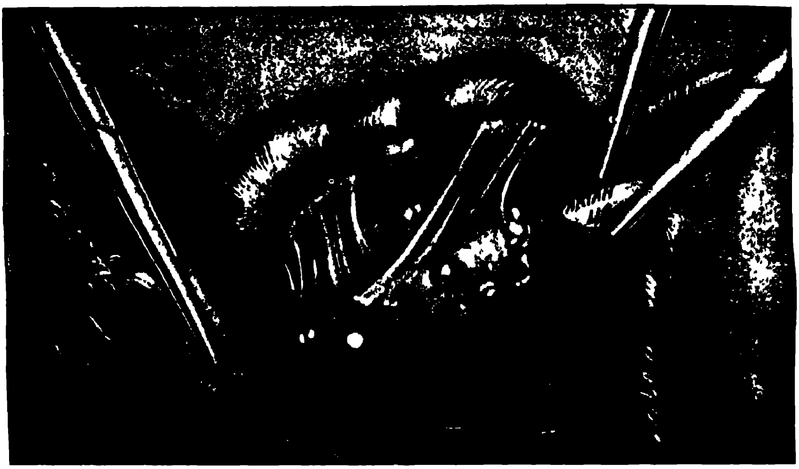

FIG. 232.—TREATMENT OF THE PEDICLE IN SALPINGO-OÖPHORECTOMY (modified from Kelly and Noble). Three structures are secured with clamps: (1) the infundibulo-pelvic fold containing the ovarian vessels; (2) the uterine end of the tube; (3) the ovarian ligament. The tube and ovary are then cut away.

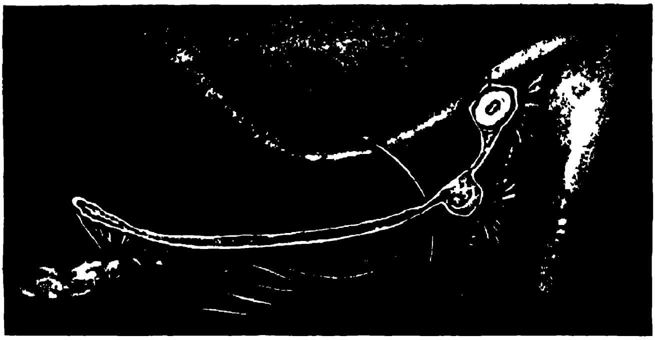

FIG. 233.—LIGATURING THE PEDICLE IN SECTIONS AFTER THE TUBE AND OVARY HAS BEEN CUT AWAY (modified from Kelly and Noble).

In all suppurative cases the greatest care must be taken to isolate the operation area by packing off the general peritoneal cavity with swabs and compresses of antiseptic gauze.

Collections of pus in the tube or ovary may be evacuated with a trochar, or by an incision, before attempting to draw them out of the wound; in this way the escape of pus can be controlled better than when the abscess bursts during the manipulations. When the adnexa of both sides are the seat of suppuration, it is advantageous to remove the uterus by supra-vaginal hysterectomy, along with the tubes and ovaries. The uterus is functionally useless when the ovaries have been extirpated, and there is therefore no advantage in leaving it; on the other hand, the endometrium is often infected in these cases, and the retention of the uterus frequently incurs the continuance of leucorrhœa and pelvic pain, and so detracts from the success of the operation. The removal of the uterus does not appreciably increase the severity of the procedure. Drainage either vaginal, or abdominal, or both, is almost always required in suppurative cases.

(B) *In Non-suppurative Cases.*—In non-suppurative conditions an attempt should always be made in the case of women, under forty years of age, to avoid the complete removal of both ovaries. In cases of bilateral hydrosalpinx the tubes may be removed (salpingectomy) without the ovaries, when the latter are unaffected except for the presence of peri-oöphoritic adhesions; if the ovaries are also the seat of small cysts, as is frequently the case, resection of the diseased portions is often practicable, leaving sufficient ovarian tissue to maintain the ovarian functions. Multiple small cysts may be destroyed by the actual cautery and the ovary then dropped back into its place.

*Salpingectomy.*—This operation consists in dividing the mesosalpinx from the infundibulo-pelvic fold to the cornu of the uterus, and then cutting through the isthmus of the tube, or excising the interstitial portion along with the remainder. The divided mesosalpinx is secured with two or three fine silk ligatures, the vessels it contains being small and unimportant except near the uterine border (see fig. 40). The tissues at the angle of the uterus are very vascular, and bleeding points must be carefully controlled in this position. This procedure forms also the operation of choice in cases of tubal gestation; the ovary as a rule is healthy, and it is unnecessary to sacrifice it if this is not necessitated by its relation to the gestation sac.

*Salpingostomy* consists in constructing an artificial abdominal ostium in the ampullary portion of the tube. It is suitable only for cases of chronic hydrosalpinx in which the contents are thin and serous, the walls of the tube not thickened, and in which the patency of the tube can be demonstrated by passing a probe up to the uterus. An incision an inch long is made upon the dorsal surface of the tube, which goes through all the coats; the edge of the tubal mucosa is then united to the peritoneal coat with a few fine interrupted stitches. The results of this procedure as regards future pregnancy are not encouraging.

*Resection of Follicular Cysts.*—Small follicular cysts not exceeding the size of a pea are frequently found in healthy ovaries, and do not call for removal. When such cysts exceed the size of a cherry it is better to remove them by resection. A wedge-shape piece is first cut out, including the greater portion of the cyst wall; the base of the cyst will then be found to present a definite lining membrane which can be peeled off with forceps. The incision in the ovary is then closed with fine interrupted silk stitches. All bleeding must be carefully controlled before the ovary is dropped back into the pelvis.

The *vermiform appendix* should be carefully examined in all cases of inflammation of the adnexa, for it is frequently found to be involved in the adhesions, and may in some cases be the primary focus of the inflammation. When clearly healthy and free from adhesions and concretions it need not be removed; but in all circumstances of doubt its removal is advisable. The procedure required is merely to secure the mesentery with two or three fine silk ligatures, crush the base of the appendix close to the bowel with a pair of artery forceps, cut away the appendix, secure the stump with a ligature, and bury it with a purse-string suture or with interrupted stitches, passed into the muscular coat of the cæcum.

## ABDOMINAL HYSTERECTOMY FOR FIBROID TUMOURS

The modern operation consists essentially in the complete separation of the uterus from its broad ligament attachments, and the control of hæmorrhage by direct ligature of the ovarian, uterine, and accessory vessels. This operation has entirely superseded the older procedure in which the cervix was secured by a serre-nœud, and fixed in the abdominal wound, to be subsequently separated by a slow process of sloughing. In the operation usually performed the uterus is amputated at the level of the internal os (*supra-vaginal or sub-total hysterectomy*), the cervix being left with its vaginal insertion undisturbed. This operation may be modified by separating the cervix completely from the vagina, and thus removing the entire uterus (*panhysterectomy*). The supra-vaginal operation is simpler and easier, and therefore generally to be preferred ; it is, however, impracticable in many cases of cervical fibroids where the whole cervix must necessarily be removed. The complete operation has the immediate advantage of providing free vaginal drainage, but in most cases drainage is not required. It has the immediate disadvantages of involving greater risk of damage to the ureter, and of being, generally speaking, a lengthier operation.

A certain number of cases has been recorded in which cancer has occurred in the cervical stump left after supra-vaginal hysterectomy (see p. 261). These cases are claimed by advocates of the total operation as further arguments in favour of the latter procedure.

## Supra-vaginal Hysterectomy

In all cases a median incision extending from the umbilicus to the pubic bone is required to give free access to the pelvis ; when the tumour reaches far above the umbilicus the incision must be suitably extended upwards. In cases of cervical or retro-peritoneal fibroids the bladder is often elevated by the tumour so as to extend a considerable distance above the pubes ; when making the incision great care should accordingly be exercised after the aponeurosis has been divided. After opening the peritoneal cavity the relations of the tumour, and the condition of the tubes and ovaries, should first be carefully examined ; the tumour should then, if possible, be drawn out through the abdominal wound. In order to draw the tumour out of the wound the appendages must, if adherent, be first set free ; retro-peritoneal tumours cannot as a rule be drawn out of the wound, and have to be dealt with *in situ*. The steps of the operation are as follows :

I. The round ligament of one side is first separately clipped and divided. When the ovary is healthy it is desirable not to remove it, except in the case of women who have passed the climacteric period. The upper part of the broad ligament should consequently be divided between two pairs of forceps placed between the uterus and the ovary, i.e. through the ovarian ligament; the blood supply to the ovary through the infundibulo-pelvic fold is thus left unaffected. When the ovary is to be removed the infundibulo-pelvic fold itself is clamped and divided outside the outer end of the tube, so as to secure the ovarian vessels near the pelvic brim. The division of the broad ligament is then completed by cutting through it horizontally inwards to the uterine border. This procedure is then repeated upon the opposite side.

II. A transverse incision is carried across the front of the uterus uniting the incisions in the broad ligaments. It should pass just above the reflection of the peritoneum from the bladder to the uterus, and should divide the peritoneal membrane only. The line of reflection is usually identified without difficulty by inspection, but a bladder sound may be introduced by an assistant if necessary. The peritoneum and bladder can now be gently pushed down with a swab so as to expose the supra-vaginal cervix, and below this the anterior vaginal wall. The plane of separation is through cellular tissue, but sometimes dense fibrous bands are encountered, and these may be dealt with by dividing them with scissors close to the uterine wall.

III. This dissection exposes the uterine vessels lying at the sides of the uterus. They are surrounded with loose strands of fibrous and cellular tissue, and after being gently isolated by blunt dissection, they can be grasped in a pair of artery forceps on each side about the level of the internal os. It is not necessary to make a posterior peritoneal flap, and the uterus can therefore be immediately amputated just above the level at which the forceps have been placed. It is an advantage to make the line of amputation wedge-shaped, by cutting slightly downwards towards the vagina from the anterior and posterior surfaces of the neck of the tumour.

IV. The stump of the cervix is now picked up with vulsellum forceps, and the vessels which have been clamped are secured by silk ligatures. Mucus oozing from the divided cervical canal is carefully wiped away, and if there is any suspicion of infection, gonorrhœal or septic, the canal should be swabbed out with pure carbolic acid.

V. The divided cervix now often presents several small spouting arteries, and these can best be controlled by passing one or two sutures on *each side of the cervix* in the following manner: The needle picks up first the edge of the anterior peritoneal flap which has been pushed down with the bladder, then passes deeply through the cervical tissues, and lastly picks up the divided edge of the peritoneum on the back of the cervical stump. Most of the vessels enter the cervix at the side, consequently this ligature should be placed near the lateral border, where it can be introduced without traversing the cervical canal. On tying this ligature the redundant anterior peritoneal flap is brought over the cut surface of the cervix to join the peritoneal edge at the back. Two ligatures of this kind, one on each side of the cervix, usually suffice to control oozing. Outside the cervix the anterior and posterior walls of the broad ligament may be approximated by a continuous fine silk suture, or by a few interrupted stitches; the peritoneal edges should be brought accurately together in all parts, and oozing carefully controlled. Drainage is not required if hæmostasis has been properly carried out.

**Panhysterectomy.**—The earlier stages are the same as in the operation just described up to the point at which the uterine arteries are clamped. In the total operation these vessels are next carefully divided against the uterine wall and secured by ligatures. The cervical wall is then cleared all round in a downward direction by blunt dissection, aided by division of fibrous bands with scissors close to the cervix. This dissection displaces the ureter downwards and outwards away from the cervix. It is especially important to clear the cervix anteriorly, where the bladder must be pushed well down so as to expose at least an inch of the anterior vaginal wall. When the anterior vaginal wall is reached this is divided with scissors, and the finger being passed into the vaginal canal, the separation of the cervix from its vaginal insertion is carefully completed all round. If these precautions are taken there is little fear of injuring the ureter. The divided vaginal wall is then seized with forceps, and a branch of the vaginal artery on each side is usually found to require a ligature. The vaginal walls need not be completely approximated; after all oozing has been stopped, the peritoneum may be closed over the vaginal incision from one ovarian pedicle to the other, or room may be left in the middle line for a drain to be passed down into the vaginal canal.

A different method of performing this operation is recommended by Doyen. In this method the first step is to open the posterior fornix from above with a long pair of curved scissors, passed down into the pouch of Douglas. Through the opening thus made the cervix is seized with a pair of vulsellum forceps and pulled upwards. Guided by the finger, the vaginal insertion is then divided all round with scissors, and the bladder separated from below upwards by the finger. Then the broad ligaments are similarly divided from below upwards, and the uterine and ovarian vessels secured. The vaginal walls and pelvic peritoneum are dealt with as in the operation just described.

## PANHYSTERECTOMY FOR MALIGNANT DISEASE

When the body or neck of the uterus is the seat of malignant disease the affected organ should be removed in its entirety, together with the tubes and ovaries. When the disease is situated in the *uterine body* the method of panhysterectomy practised in the case of fibroid tumours may be adopted, with the proviso that the tubes and ovaries must in all cases be entirely removed along with the uterus. The tendency of uterine cancer to invade the proximal part of the tube, and to spread along the lymphatic trunks in the upper part of the broad ligament, is well recognised (see p. 299), and it is therefore important that these structures should be removed in order that the whole of the disease may be eradicated. In cases where the new growth is ulcerating, and an offensive discharge exists, great care must be taken to avoid fouling of the peritoneum and of the cut edges of the abdominal wall. Cases of corporeal cancer such as these may be dealt with by the *combined method* of hysterectomy, whereby the risk of infection is greatly reduced. (This consists first in plugging the cervical canal and then sewing the lips of the external os together, to prevent discharges escaping. Next, the cervix is isolated and the bases of the broad ligaments secured as in the first and second stages of vaginal hysterectomy (see p. 559). Then the vagina is lightly plugged with antiseptic gauze and the abdomen opened. The uterus can now be readily freed from its remaining attachments, and removed along with the tube and ovaries. Free drainage into the vagina must be practised in such cases by means of gauze, or a large rubber tube fixed to the cut edges of the vaginal wall with a catgut stitch.)

Cases of *cervical* cancer can best be dealt with by the abdominal operation next to be described.

**Panhysterectomy for Cancer of the Cervix (Wertheim's Operation).**—This comparatively modern operation, which is at present on its trial, aims at removing along with the uterus any pelvic glands that may be found enlarged, and as much of the pelvic cellular tissue in the neighbourhood of the cervix as is practicable. For this purpose it is necessary to dissect out and isolate the ureters in the floor of the pelvis. The operation is very severe, and produces a severe degree of shock; it is accordingly unsuitable for patients who are over 60 years of age, or who are debilitated by the progress of the disease or by hæmorrhage from the growth. The primary mortality is much higher than that attending the other varieties of hysterectomy already described.

A median incision extending from the umbilicus to the pubes is necessary to fully expose the pelvic viscera. A careful examination must then be made to determine the extent of the growth and the condition of the pelvic cellular tissue and glands. The internal iliac and the lumbar chains of glands are those to which attention should be directed (see p. 63). Enlarged glands which, though hard, are movable can often be readily enucleated and are not in all cases actually cancerous, and therefore do not contra-indicate the operation; but chains of glands enlarged, matted, and fixed do so absolutely. Cellular infiltration does not make the removal of the disease impracticable as long as it is confined to the broad ligaments, but when extensive it is doubtful if the operation is of any real value in prolonging life. Definite thickening of the cellular tissue anteriorly contra-indicates the operation in all cases, since, if the disease is to be adequately dealt with, a portion of the bladder wall must be excised; although ~~surgically~~ practicable, this procedure is of very doubtful expediency. Examination of the pelvic organs from above, in this manner, is of the greatest service, and allows a much more exact definition of the limits of the disease than can be obtained in any other way. It is especially useful in distinguishing thickening due to chronic disease of the adnexa from malignant infiltration (see p. 286); and cases dealt with in this manner sometimes turn out to be more favourable than was supposed from the clinical examination; on the other hand, the disease may be shown to be much more advanced than was previously supposed.

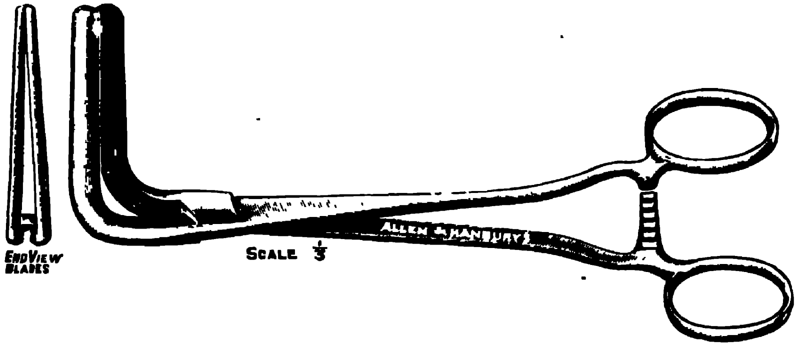

Fig. 234.—Author's Modification of Wertheim's Vaginal Clamp. The blades are forged so that the tips come into contact with one another while the heel of the curve is still open. On locking the blades all the tissues included between the tip and the heel are firmly grasped.

The first part of the operation follows precisely the first and second steps of the operation of sub-total hysterectomy (p. 550), the ovaries and tubes being removed in all cases. After full and careful separation of the bladder anteriorly, so as to expose the vaginal wall, the anterior peritoneal flap of the broad ligament is stripped forwards off the pelvic wall up to the level of the brim. The ~~uterine~~ artery can now be seen passing forwards and inwards, and can be secured about an inch outside the wall of the cervix and divided between two ligatures.

The next step is the isolation of the ureter. In most cases the ureter can be defined by taking up the posterior peritoneal layer of the broad ligament between the finger and thumb is always low down, but at a variable depth, the ureter will be felt as a softish cord which rolls between the fingers. If the broad ligament is much thickened, it may be necessary to seek the ureter at the level of the pelvic brim, where it lies close to the ovarian artery (fig. 2), and trace it forwards from that point. Its size is subject to considerable variation. It can be picked up on a blunt curved needle, and by careful blunt dissection cleared of the surrounding cellular tissue and followed right up to the base of the bladder. A clean dissection of the wall of the ureter must not be attempted, as this procedure

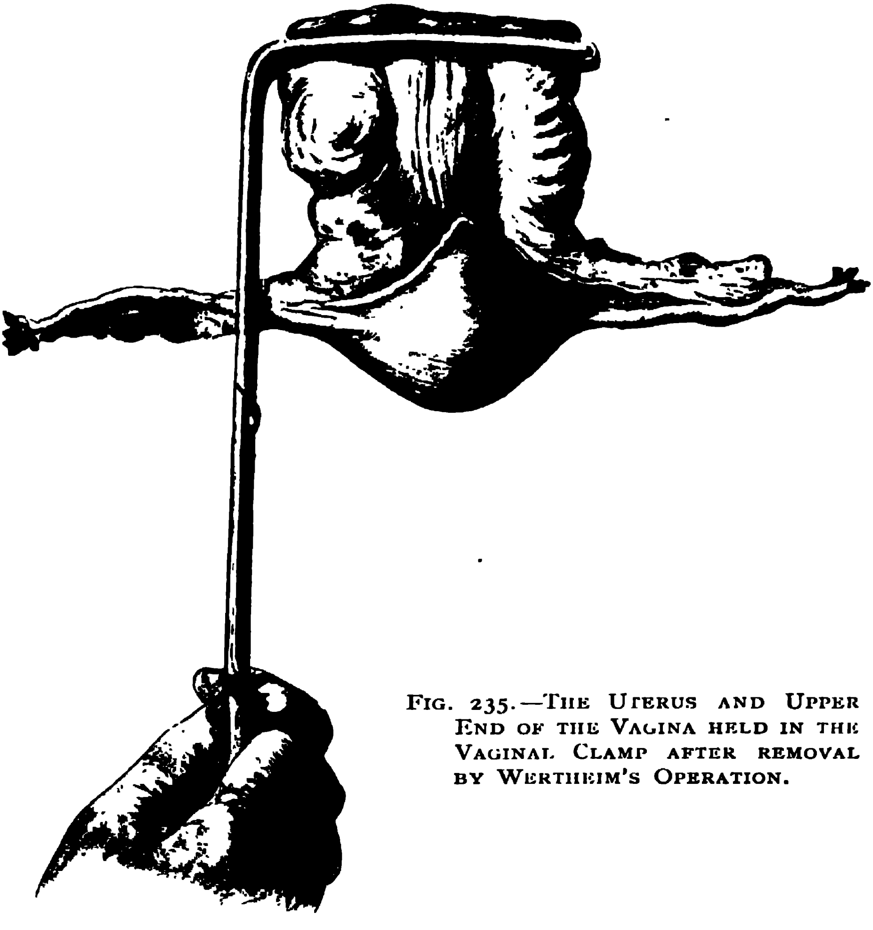

FIG. 235.—THE UTERUS AND UPPER END OF THE VAGINA HELD IN THE VAGINAL CLAMP AFTER REMOVAL BY WERTHEIM'S OPERATION.

injures its blood supply and may be followed by necrotic changes leading to perforation and the formation of a uretero-vaginal fistula. As it reaches the cervix the ureter passes beneath the thick mass of cellular tissue forming the parametrium, and through this the finger can be pushed up to the bladder. After the uterine arteries have been divided this mass of cellular tissue can be dissected away, the ureter being protected by the finger. After thus clearing the ureters on both sides, the upper part of the vaginal walls must be similarly cleared all round, as a portion of the upper part of the vagina is to be removed along with the uterus. It is necessary to free the anterior vaginal wall by pushing down the bladder for at least an inch and a half below the vaginal insertion. The position and extent of the portion of the growth contained within the vagina can be identified with finger and thumb.

This clearance having been effected, a special strong clamp (fig. 234), is placed upon the vagina so as to grasp it below the level to which the growth can be felt to extend. In fixing it the ureters must be drawn to one side and carefully guarded. The vagina is now divided *below* the clamp, and then the uterus can be withdrawn with the vagina clamped over the growth (fig. 235), which accordingly is never exposed during the whole of the manipulations.

The ureters can now be allowed to fall into the cellular tissue bed from which they were raised, and any enlarged glands may be dealt with by enucleation. Free vaginal drainage is always advisable, and it is therefore better, after all oozing from the vaginal edges and cellular tissue has been controlled, not to sew up the opening into the vagina.)

## MYOMECTOMY

This operation consists in the removal of a fibroid tumour, or sometimes of more than one, from the uterus by incision and enucleation, the functional entirety of the organ being preserved. The great advantage of not sacrificing the uterus in the case of young women should lead to this operation being selected whenever the local conditions permit of its performance. It is most suitable for cases in which the fibroid is solitary and of not more than moderate size; further, the tumour should not encroach to any great extent upon the uterine cavity, i.e. it should be mainly subserous or interstitial in position. Cases which do not comply with all these requirements may undoubtedly also be dealt with by myomectomy, but the desirability of this operation is then open to question. The main disadvantage of myomectomy is that it does not protect the patient against the liability to the growth of other fibroids later on. In young women the compensating benefits secured from the retention of the uterus, and the prolongation of the period of child-bearing, may be held to be sufficient. In women at or near the age of the menopause myomectomy offers no advantages and need not be considered.

In the case of small fibroids myomectomy may be performed per vaginam; the removal of submucous growths in this way by dilatation or incision of the cervix will be described on p. 569; small subperitoneal or interstitial growths may also be removed by posterior or anterior colpotomy (p. 599), the uterus being drawn through the peritoneal opening into the vagina. Only tumours of quite small size can be dealt with in this way. As a rule, the abdomen must be opened and the operation performed from above.

After opening the peritoneal cavity the uterus should be drawn out, the relations of the growth or growths carefully examined, and the general abdominal cavity packed off with swabs. In the case of a solitary tumour an incision is made over the middle of the projecting area from above downwards. This incision should be deep enough to divide at once the uterine wall and the capsule, and expose the tumour itself. The divided tissues retract freely, and the growth can then be seized with toothed forceps and enucleated from its bed by the aid of the finger and a blunt dissector; dense bands of fibrous tissue may be cut with scissors close to the tumour. Free bleeding occurs from the bed or capsule of the tumour, but this may be temporarily controlled by packing with a swab. The uterus should now be carefully palpated as other smaller growths are often to be felt; these, if possible, should be removed through the same incision, but a second or third incision can be made if necessary. The bed of the tumour should next be carefully inspected to see if the uterine cavity has been opened. If this has occurred, the aperture must be closed with interrupted stitches of chromic catgut, including endometrium and muscular tissue. Bleeding points in the uterine wall must be under-stitched, and the redundant part of the capsule cut away. Finally the edges are carefully adjusted with a series of interrupted stitches followed by a continuous stitch. It is of great importance that oozing should be completely controlled.

## VAGINAL HYSTERECTOMY

The removal of the uterus by the vaginal route is impracticable in the case of large fibroid tumours, and this operation is suitable only when the uterus is of comparatively small size. In the past it has accordingly been principally made use of in cases of malignant disease of the body or cervix, in cases of small fibroid tumours requiring radical operation, and in the comparatively rare cases in which the removal of the uterus becomes necessary not for new growths but for chronic metritis or fibrosis, or for pyometra. The recent development of the abdominal operation for uterine cancer has, however, made encroachments upon the field of application of the vaginal operation. For non-malignant conditions the operation retains its place, but for malignant disease it is not to be recommended save under exceptional conditions, such as advanced age, which contra-indicate the more severe abdominal operation.

As compared with abdominal hysterectomy the vaginal operation has the advantages: (1) that it induces much less shock and is therefore preferable in aged or enfeebled women; (2) that convalescence is attended with fewer risks; (3) that there is no subsequent risk of scar hernia. On the other hand it has the disadvantages: (1) that in all cases the field of operation is imperfectly exposed, and efficient asepsis is difficult to maintain; (2) that in malignant cases the extent of the disease and the condition of the glands cannot be determined accurately before the operation is begun; (3) that careful dissection and removal of infected cellular tissue and glands is impracticable; (4) in cases of cancer of the cervix the additional disadvantage must be borne in mind, that direct handling of the growth cannot be avoided, and may possibly lead to implantation of active cancer cells upon freshly cut tissues, and the subsequent formation of implantation metastases.

The operation is performed with the patient in the modified lithotomy position.

*First Step.*—The vulva and vaginal walls are thoroughly swabbed with an efficient antiseptic solution, such as lysol ʒi to Oi, or biniodide of mercury 1/4000. A duck-bill or Auvard's speculum (fig. 242) is then introduced to expose the cervix. The cervix is firmly seized with one or two pairs of vulsellum forceps (see fig. 244) and pulled down as near to the vulva as possible. A sound is then passed into the bladder and its point used to show the level to which the bladder descends upon the anterior wall of the cervix. A transverse incision about one-and-a-half inches long is then made across the front of the cervix a quarter of an inch below the lowest level of the bladder. This incision divides the vaginal mucous membrane and opens up the cellular tissue plane lying between it and the wall of the cervix. In this plane the bladder lies, and it can now be separated upwards from the wall of the cervix until the level of the peritoneal reflection is reached. In a parous woman this can usually be done with the finger alone; in a nullipara fibrous bands are often encountered which should be divided with scissors close to the wall of the cervix. The separation should be carried by the finger outwards on each side into the broad ligaments; this will separate the ureters from the cervix and allow them to be pushed out of the way when tying the uterine arteries later on.

*Second Step.*—Now the posterior fornix is exposed by pulling the posterior lip of the cervix forwards and depressing the posterior vaginal wall with a flat retractor as in posterior colpotomy (fig. 267), and a transverse incision is made across the back of the cervix at a somewhat higher level than in front. This incision opens up the same connective tissue plane posteriorly; the peritoneum forming the floor of the pouch of Douglas can now be defined, picked up with forceps and divided freely with scissors in a transverse direction. The anterior and posterior cervical incisions are now united laterally, and the vaginal mucous membrane separated from the sides of the cervix by blunt dissection in an upward direction for about half an inch (fig. 237). So far the effect of the operation has been to isolate the cervix from its vaginal insertion.

*Third Step.*—This consists in the complete separation of the uterus by dividing the utero-sacral and broad ligaments; this may be effected by means of *ligatures*, or *clamps*, or by a combination of the two.

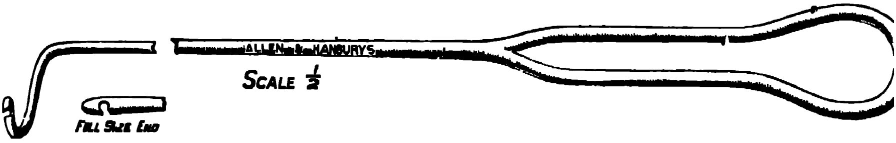

FIG. 236.—WORRALL'S BROAD LIGAMENT NEEDLE FOR VAGINAL HYSTERECTOMY.

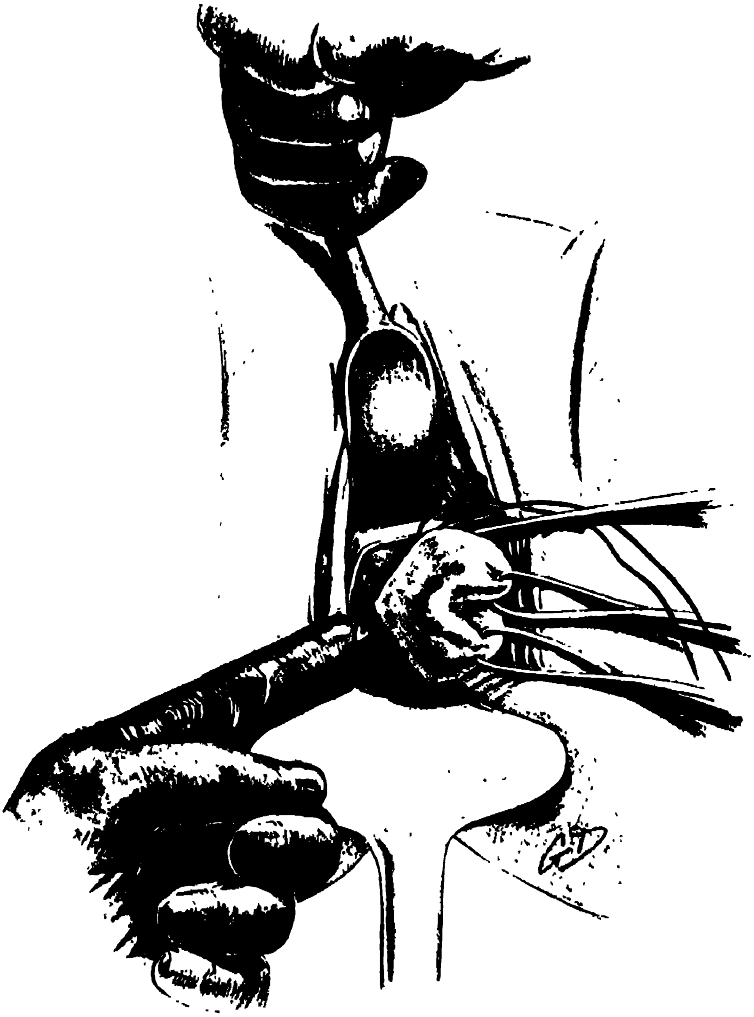

FIG. 237.—VAGINAL HYSTERECTOMY: TRANSFIXING THE BASE OF THE BROAD LIGAMENT (Wertheim and Micholitsch). The cervix has been cleared from its vaginal attachments, and the base of the right broad ligament has been transfixed with a needle threaded with stout silk.

When the *ligature* method is adopted, the broad ligaments are transfixed with a suitable long-handled, curved, pedicle needle (fig. 236), and then tied off and divided in sections, from below upwards. The needle must be passed close to the cervical wall to avoid the risk of including the ureter,

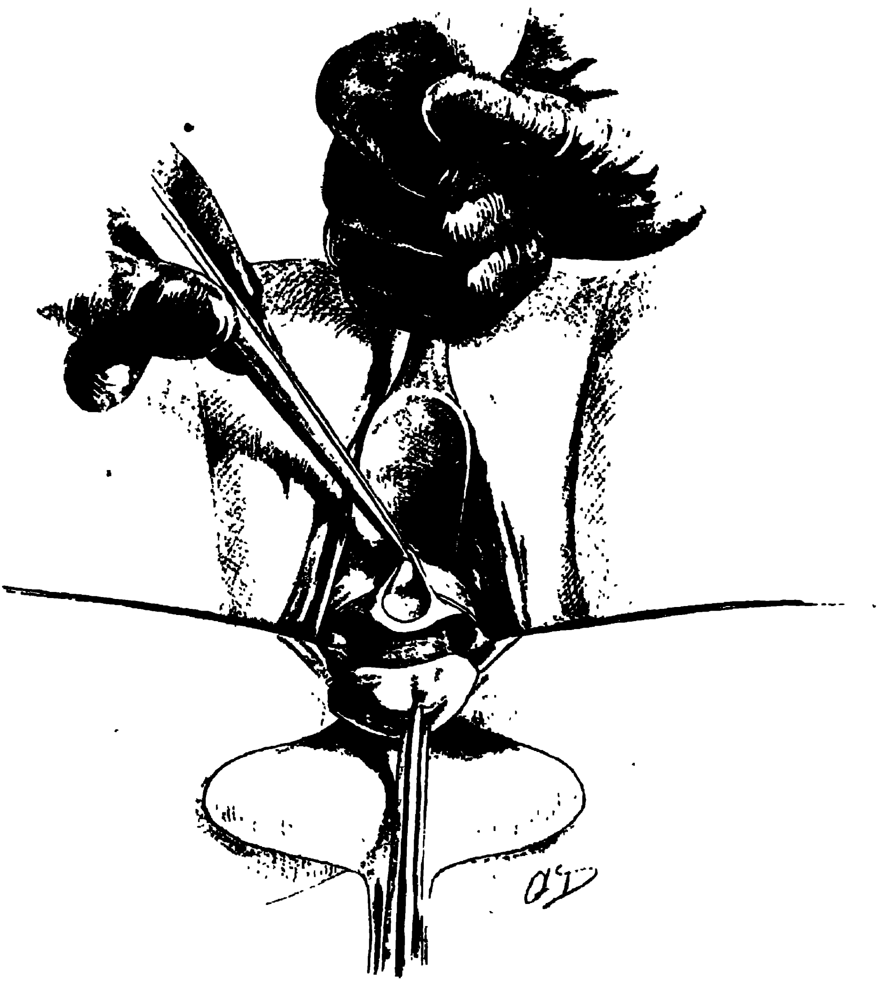

FIG. 238.—VAGINAL HYSTERECTOMY: OPENING THE UTERO-VESICAL PERITONEAL POUCH (Wertheim and Micholitsch). The base of the broad ligament has been ligatured and divided on each side. The anterior peritoneal pouch has been picked up and opened.

until the division has been carried well above the level of the internal os. The base of the broad ligament first included is thick and its tissues dense; only a small amount of tissue can be taken up in the first ligature placed on each side. After the ligature has been knotted, the tissue included in it is divided as close as possible to the wall of the cervix (fig. 238). When the cervix has thus been freed from its broad ligament attachments on both sides, the uterus can be pulled further down, and the peritoneum of the utero-vesical pouch picked up with forceps and freely divided transversely under direct observation (fig. 238). With vulsellum forceps the body of the uterus is now gradually pulled through the anterior peritoneal opening into the vagina. This allows of the upper portions of the broad ligaments being ligatured and divided from above downwards, the parts being well exposed to view. The tubes and ovaries may also be pulled out into the vagina and, if necessary, removed along with the uterus, the broad ligament being then divided through its infundibulo-pelvic fold. If the body of the uterus is too large to be drawn through the peritoneal opening, the anterior wall may be split in the middle line from the external os upwards, when the uterus can be inverted (turned inside out) and drawn through the aperture without difficulty. It is undesirable to open the uterus in this way in cases of malignant disease, and especially so if the growth is necrotic and the discharge offensive.

When the clamp method is employed, the anterior and posterior peritoneal pouches are opened early in the operation, and a pair of special long clamps passed up at each side of the uterus so as to include the whole of the broad ligament and extend above the tubes. The finger must be used to guide the clamp, and great care is necessary to avoid including omentum or bowel in its grip. When the clamps are both in position the uterus is cut away by dividing the broad ligament between the clamp and the uterine border on each side. The clamps remain in position for forty-eight hours and are then removed; considerable necrosis of the clamped tissues occurs, and the vessels are of course sealed by thrombosis. Recurrent hæmorrhage may occur from the clamps slipping, or from ulceration of the necrosed tissues reopening a large vessel.

The ligature method is preferable as securing more reliable hæmostasis, and as being much more free from the risk of recurrent hæmorrhage.

During these manipulations frequent use should be made of a sterile saline, or weak antiseptic douche, owing to the difficulty of maintaining efficient asepsis in vaginal operations.

When the uterus has been removed, the field of operation is carefully inspected, and oozing points are secured. Free drainage is necessary, and consequently it is better not to close completely the opening into the peritoneal cavity; the lateral edges of the vaginal opening may be closed, but the central part should be lightly plugged with sterile or antiseptic gauze, which prevents prolapse of a coil of intestine or a piece of omentum into the vagina, and preserves a suitable channel for drainage. Finally, the catheter is passed and the presence of clear urine will demonstrate the absence of injury to the bladder.

*Convalescence.*—The gauze plug may be removed in forty-eight hours, and the vaginal canal swabbed out carefully with lysol solution. Douching should not be practised for the first week. The ligatures separate spontaneously in from ten to fourteen days.

## OPERATIONS FOR THE FIXATION OF THE UTERUS IN A POSITION OF ANTEVERSION

The uterus may be fixed anteriorly (1) by stitching the body to the abdominal parietes (ventrifixation: hysteropexy); (2) by shortening the round ligaments; (3) by stitching the body to the anterior vaginal wall (vaginalfixation). These procedures are called for in certain cases of backward displacement of the uterus, and in certain cases of prolapse.

**Ventrifixation or Hysteropexy.**—This operation consists in opening the abdomen by a median or a transverse supra-pubic incision, freeing the uterus and adnexa from any adhesions which may be found, and then stitching the uterine body to one or more of the layers of the abdominal parietes. In cases uncomplicated by adhesions the operation is one of great simplicity; old adhesions, however, may cause considerable trouble by binding down the tubes and ovaries. These organs, as well as the uterus, must be completely freed, for it is of great importance that no traction upon the uterus should remain after it has been fixed to the abdominal wall. Conservative operations upon the adnexa can be combined with ventrifixation when the conditions render this desirable.

The introduction of the sustaining sutures is a point of great importance. In the case of young women the aim of the operation must be to fix the uterus in a position which will not interfere with its development if pregnancy should follow. The upper part of the uterine body must therefore be left free and the sutures introduced into the anterior wall as low down as possible ; the sutures must, however, in all cases be placed above the level of the peritoneal reflection on to the bladder, which should be carefully identified before they are introduced. In this way the bladder will be avoided, the fundus will be left free, and the anterior surface of the uterus will be drawn into apposition with the abdominal wall.

The stitches should be of stout catgut or fine silk, and should be passed from side to side, first picking up the parietal tissues and being then carried deeply into the muscular layer of the uterus. The first two may be made to include the parietal peritoneum only on each side of the incision; a second pair may be made to include the peritoneum, rectus muscle, and aponeurosis, by which a firmer hold is obtained. Catgut ligatures are absorbed in a few weeks, and silk ligatures probably cut their way out of the uterus in time, so that in all cases the retention of the uterus in its new position is provided for by the formation of a band of adhesions in the position of the stitches. This band is often thick and strong, and although it may stretch to a length of one inch to two inches, its supporting power continues to a very great extent (see fig. 239). Stitches which include the parietal muscle and fascia approximate the uterus for the time being more firmly to the abdominal wall, while the adhesions are being formed and strengthened by organisation, for which time is required. These adhesions allow of a certain range of mobility, and it is probable that this operation seldom if ever results in fixation, strictly speaking, of the uterus. Experience shows that when carried out in this way the operation does not prejudicially affect the course of succeeding pregnancy or labour. It is often followed by conception in women who have been previously sterile from backward displacements with complications.

The functions of the bladder are not impaired by the operation ; when distended this organ no doubt finds room

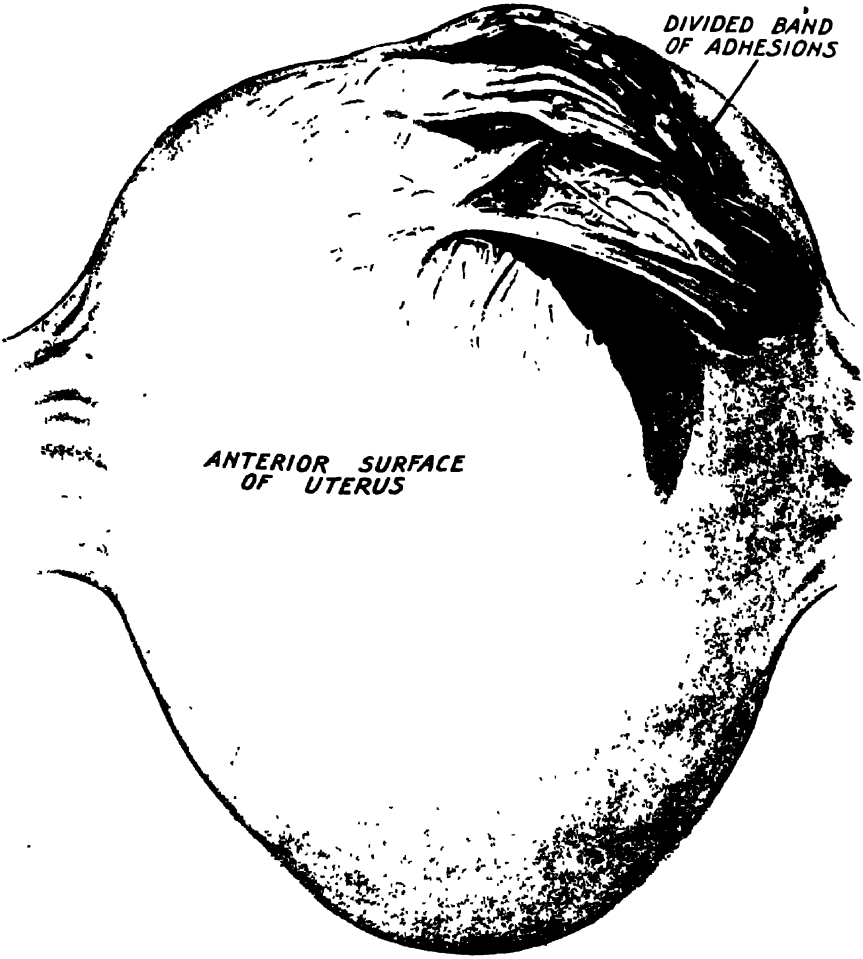

FIG. 239.—BAND OF ADHESION RESULTING FROM VENTRIFIXATION OF THE UTERUS. The uterus was removed on account of hæmorrhage from a submucous fibroid which had grown subsequent to the ventrifixation. The band measured one inch and a quarter in length.

for expansion in a lateral direction instead of in the usual median plane.

The chief indication for the operation is found in complicated cases of backward displacement for which treatment by pessaries is unsuitable (see p. 168), or in simple cases which pessaries have failed to relieve. It is also of service in cases of prolapse, but must then be combined with colporrhaphy and perineorrhaphy, for the uterine adhesions are unable of themselves to sustain the drag of the prolapsed structures.

**Shortening the Round Ligaments.**—The effect of reducing the length of the round ligaments is to draw upon the fundus and approximate it, when displaced backwards, to the abdominal wall, thus correcting the displacement. The shortening may be carried out either extra-peritoneally or intra-peritoneally.

The *extra-peritoneal* operation was simultaneously introduced by Alexander of Liverpool, and Adams of the United States, and is known as Alexander-Adams's operation. It consists in exposing the external abdominal ring upon each side, and isolating the round ligament as it leaves the inguinal canal ; then by traction the ligament is pulled out of the canal until about two inches have been withdrawn ; it is then cut off, and the stump firmly stitched to the pillars of the external ring. This procedure is only practicable in cases of uncomplicated, non-adherent backward displacement ; when adhesions are present the uterus cannot be raised by traction on the round ligaments. Though its field of application is thus limited, it yields good results in favourable cases. If attendant disease of the uterine adnexa is present this operation is contra-indicated.

More recently several *intra-peritoneal* methods of shortening the round ligaments have been practised. In these operations the peritoneal cavity is opened and each ligament shortened by forming a loop in the intra-abdominal portion, and then fixing the loop in such a position that the fundus will be drawn forwards and anteverted. As the strongest part of the round ligament is that nearest the uterus, it is important that the loop should be made as near as possible to the uterine cornu. The loop is formed by picking up a piece of the ligament about one inch and a half external to the uterine border; the two limbs of the loop are then united to one another with one or two stitches (see fig. 240). The loops thus made may be fixed in one of several different ways. Thus each loop may be fixed to the anterior surface of the uterus and to its fellow of the opposite side. Or the loops may be passed backward through an opening in the mesosalpinx, and stitched to the back of the uterus, so as to form a hammock in which the uterus is slung. The best method

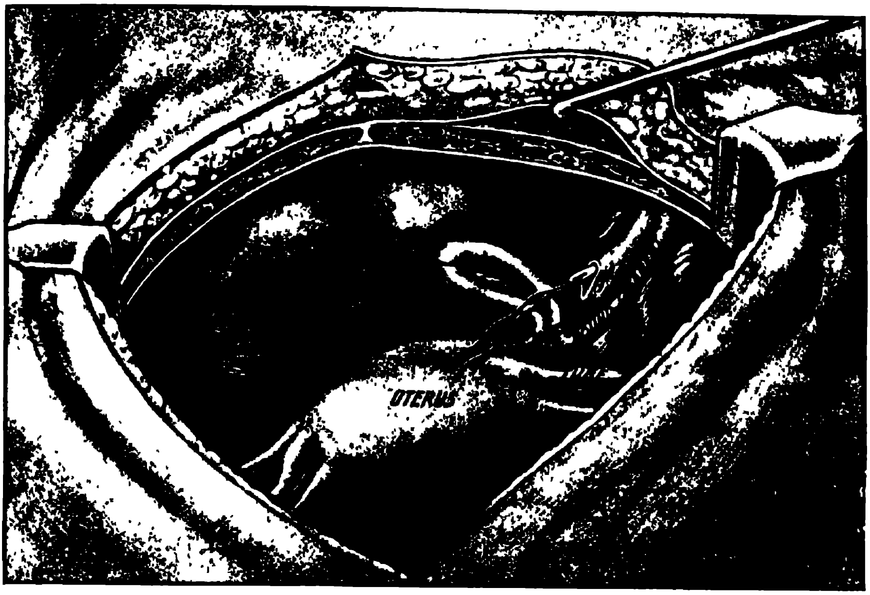

FIG. 240.—RETRO-PERITONEAL SHORTENING OF THE ROUND LIGAMENT; GILLIAM'S OPERATION (Kelly and Noble). The loop has been made in the round ligament; the needle has been passed beneath the aponeurosis to the internal abdominal ring, and thence beneath the anterior peritoneal layer of the broad ligament to the uterine cornu.

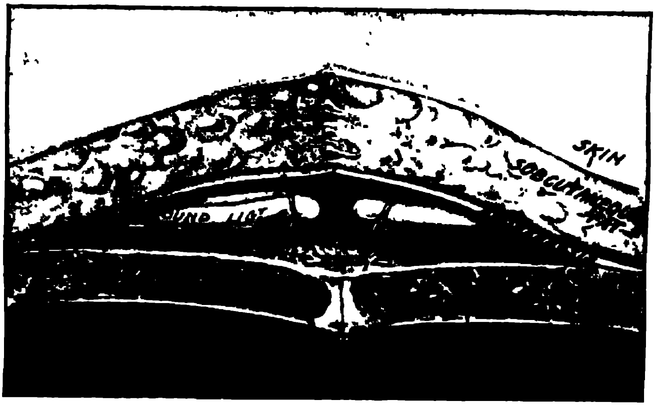

FIG. 241.—RETRO-PERITONEAL SHORTENING OF THE ROUND LIGAMENTS. Showing the position in which the loops of the round ligaments are fixed between the aponeurosis and the rectus muscle.

is, however, the retro-peritoneal method of Gilliam (figs. 240

and 241). A blunt curved needle or pair of dressing forceps is passed into the abdominal wall between the aponeurosis and the rectus muscle. The point is then directed outwards through the fibres of the rectus muscle into the plane of the transversalis fascia, and directed by the finger within, obliquely downwards and outwards to the internal abdominal ring. This point can be readily identified from within as the intra-abdominal portion of the round ligament ends there. Having reached this spot the point of the forceps is directed inwards and made to follow the line of the round ligament beneath the anterior peritoneal layer of the broad ligament until it reaches a point about one inch from the uterine border. The forceps is then pushed through the peritoneum until it emerges in the peritoneal cavity, and is then made to seize the loop in the round ligament. On withdrawing the forceps, this loop is accordingly made to traverse the track followed by the forceps, and ultimately appears in the parietal incision. After repeating this manœuvre upon the other side, the two loops can be stitched to the aponeurosis and to one another.

By this operation the uterus is held well forward, and the utero-vesical pouch is not closed, as is the case in the operation of ventrifixation. It allows freer mobility to the uterus, and is therefore more suitable in young women who may subsequently become pregnant.

When from repeated child-bearing, or other causes, the abdominal wall has been greatly weakened and the muscular and fascial structures atrophied, the success of any of these operations is always very doubtful. And further, the strength of the round ligaments is very variable; sometimes strong and well developed, they may in other cases be so thin and weak that they cannot afford adequate support to the uterus. Unfortunately, this point, upon which the success of the operation largely depends, cannot be settled until the abdomen has been opened.

In some cases a preliminary six weeks' course of massage and physical exercises for strengthening the abdominal wall may make the prospects of success more favourable.

In complicated cases of backward displacement, when the uterine body is enlarged and possibly may be the seat of chronic infection, a preliminary curetting is desirable.

Methods of vaginal fixation will be referred to on p. 603.

# PART XIII

## MINOR GYNAECOLOGICAL OPERATIONS

### DILATATION OF THE CERVIX UTERI

Apart from pregnancy, this operation may be performed in the following conditions: (1) spasmodic dysmenorrhœa; (2) as a preliminary to curetting or other intra-uterine operations; (3) to establish drainage in pyometra or purulent endometritis.

The vulva and vagina having been thoroughly swabbed and douched under the anæsthetic, a careful bimanual examination of the pelvic organs should be made as a routine procedure before anything else is done. The most convenient speculum to use is that of Auyard (fig. 242), which is self-retaining; the Sims's speculum may also be employed (fig. 57), but an assistant is then required to hold it in position and depress the perineal body. The cervix is then seized with a vulsellum forceps (fig. 244) and its condition noted. Next, the sound is passed to observe the length and capacity of the uterine cavity (see p. 103) and the condition of its walls. A firm hold of the cervix is necessary in introducing the dilators, and two pairs of the vulsellum forceps shown in fig. 244 may be used, placing one at each side of the anterior lip. Then the cervical canal is dilated with the graduated metal dilators shown in fig. 245, beginning with the smallest size and passing them in sequence until sufficient dilatation has been obtained. If the patient is a nullipara and the external os unusually small, two lateral incisions may be made into the external os of about one-third of an inch in depth. The chief resistance to the passage of the dilators is found, however, at the internal os, the difficulty being greater in nulliparous than in parous women. The first four or five dilators usually pass easily, the sixth, seventh, and eighth encounter the greatest obstruction, and at this point a certain amount of laceration of the cervical tissues in the upper part of the canal usually occurs. The remaining dilators can then be passed without difficulty. Each should be firmly pushed in and carried right up to the fundus (fig. 246). The extent to which the dilatation will be carried is determined by the purpose of the operation ; for curetting it is sufficient to dilate to number ten ; for spasmodic dysmenorrhœa dilatation should be carried up to number fourteen ; when it is desired to pass the finger into the uterus the largest sizes are generally required, depending, however, upon the size of the operator's index finger.

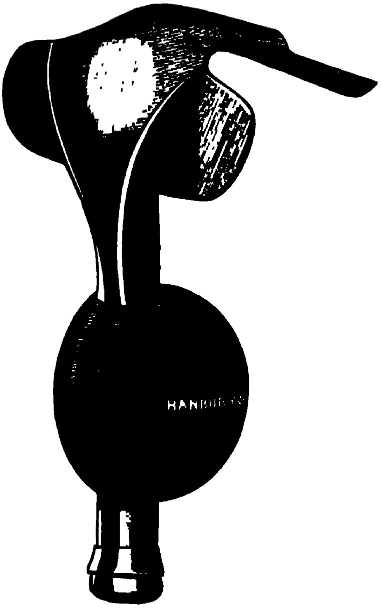

FIG. 242.—AUVARD'S SELF-RETAINING VAGINAL SPECULUM. The shank of the speculum is weighted with a ball of lead, and channelled to allow of the escape of douche fluids from the vagina.

When full dilatation of the cervix is required the procedure may be rendered easier by the preliminary use of a laminaria tent (fig. 247), which should be introduced into the cervix at least twelve hours before the operation. In swelling, the tent not only starts the process of dilatation, but causes so much softening of the cervical tissues that subsequent dilatation with the graduated bougies is facilitated, and the risk of laceration thus diminished. It is therefore especially useful when it is desired to pass the finger into the uterus in the case of a nulliparous woman. The disadvantages of the tent are that in an unmarried woman it is impossible to pass it without an anæsthetic, and that while it is in the cervix severe uterine colic (spasmodic contraction) is sometimes set up.

Tents may be sterilised by keeping them for a week or ten days in absolute alcohol. To pass them a tent-forceps, such as shown in fig. 247, is useful. After preliminary douching of the vagina, the cervix is exposed and seized with a vulsellum forceps; the tent is then passed until the upper end is well through the internal os. In a nullipara it is best to pass a small size, and if possible introduce a second beside it. In a multipara a single tent of larger size will suffice. The use of a tent is absolutely contra-indicated by the presence of purulent or offensive discharges.

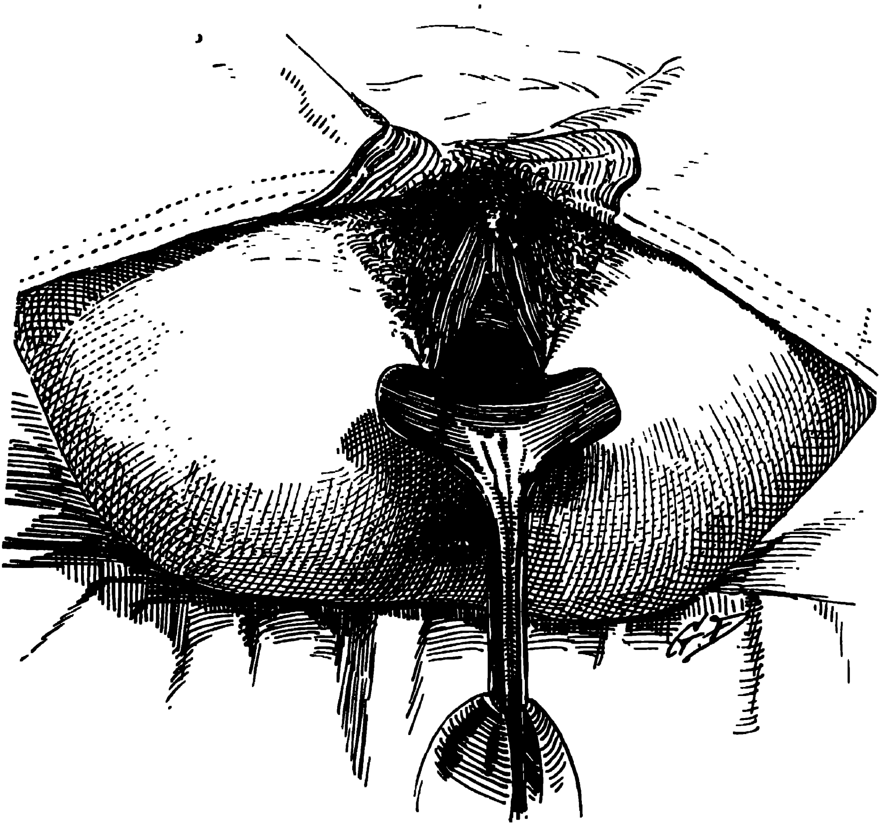

FIG. 243.—AUVARD'S SPECULUM IN POSITION. The weight of the shank keeps the blade in position, and at the same time opens the vulva. The patient is in the modified lithotomy position.

Dilatation of the cervix is frequently performed as a preliminary step, to be followed by further intra-uterine

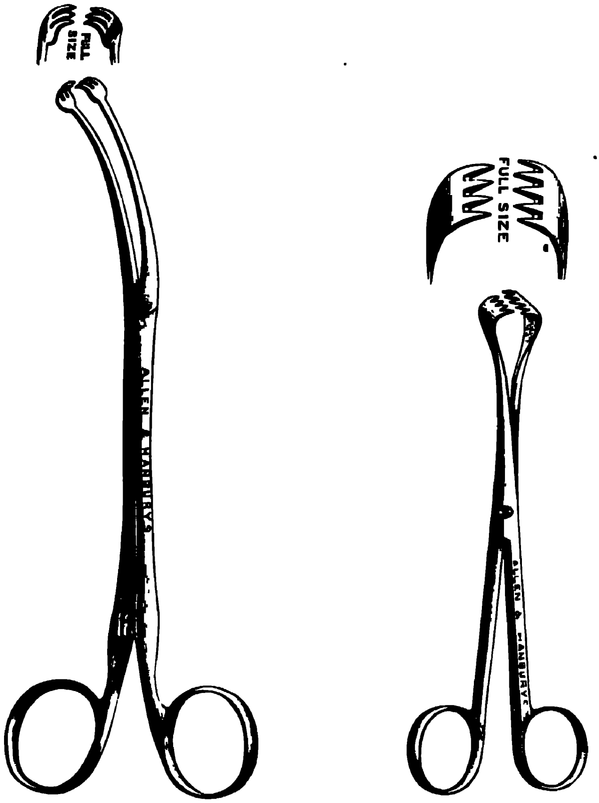

FIG. 244.—VULSELLUM FORCEPS. The short pair is stronger and more generally useful for operation work than the long pair.

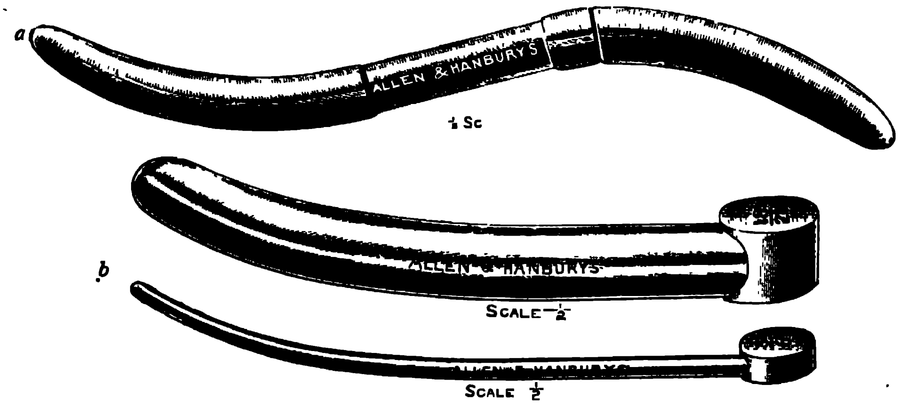

FIG. 245.—UTERINE DILATORS (*a*) Fenton's; (*b*) Hawkins Ambler's. The instrument is made of metal, and is conical, being narrower at the point than the base.

procedures such as digital exploration, curetting, removal of polypi, etc. The introduction of the finger for exploration is only required in certain cases, and these may be indicated

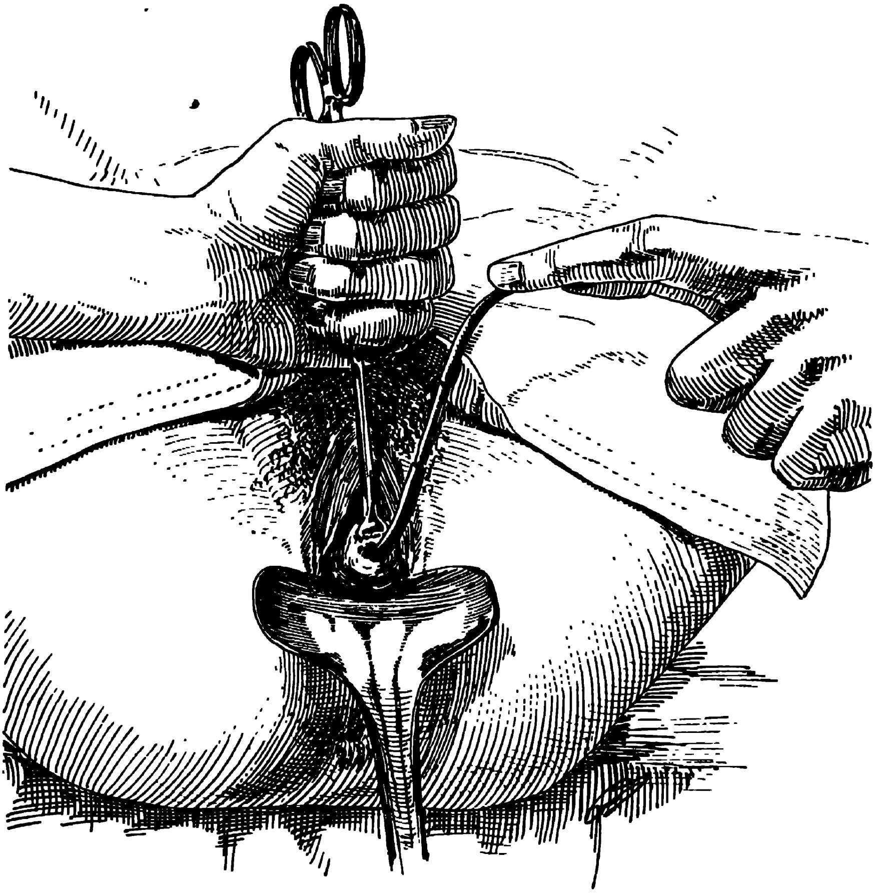

FIG. 246.—DILATATION OF THE CERVIX. The dilator (Fenton's) has been passed up to the fundus. The instrument should be held in the middle during introduction. It was held in the manner shown for photographing.

as follows: (1) when a polypus or other intra-uterine new growth is suspected; (2) in cases of hæmorrhage following abortion or child-birth, when retained pieces of placental tissue may be found; (3) when the sound reveals gross irregularity or roughness of the uterine wall; (4) when, after curetting, hæmorrhage is profuse and difficult to control (see p. 576). The index is the most convenient finger to use; traction is made with the vulsellum forceps by an assistant upon the cervix, and aided by the left hand placed in contact with the fundus, the right index is gradually pushed upwards so as to explore the walls of the uterus on both sides, and especially the tubal angles.

In the case of a nulliparous woman who has passed the menopause it is, however, very difficult to dilate the cervix sufficiently to admit the finger without causing severe laceration, and it is usually preferable to place reliance upon the sound and the curette.

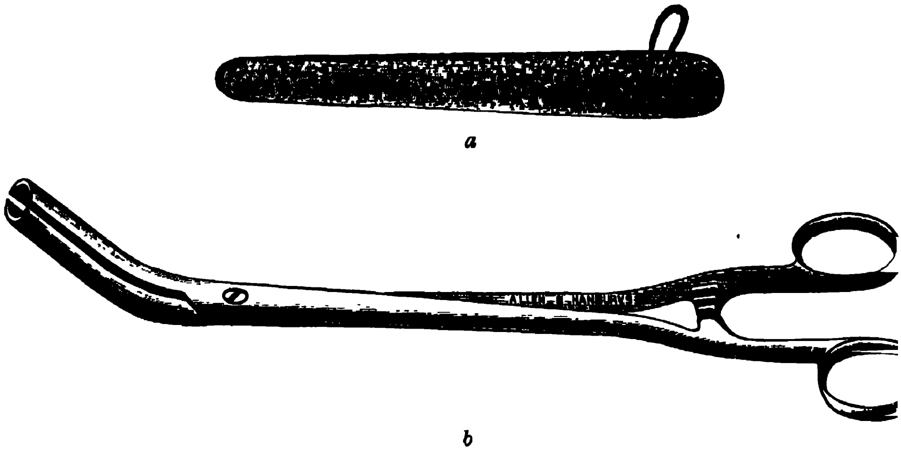

Fig. 247.—(*a*) Laminaria Tent. (*b*) Tent Forceps. The tent is made of compressed sea-tangle, which swells considerably from absorption of moisture.

## CURETTING

This operation consists in scraping away the endometrium with a sharp spoon or curette, after suitably dilating the cervix, and, in some cases, also exploring the uterine cavity with the finger. The indications for its performance are:—

1. General enlargement of the uterus not due to a new growth, and associated with hæmorrhage or discharge, e.g. subinvolution and chronic endometritis.
2. Cases of uterine hæmorrhage for which no definite cause can be found.
3. Occasionally in hæmorrhage from small interstitial fibroids.

4. Suspected malignant disease of the uterine body, for diagnosis.
5. As a preliminary to certain operations for uterine displacements.
6. Cases of sterility or repeated abortions for which no constitutional or local cause can be found.

After suitable dilatation of the cervix, the scraping is most conveniently done with a flushing curette of the patterns shown in fig. 248. The instrument is channelled to allow of sterile saline solution, or of a non-poisonous antiseptic—such as iodine or lysol—being run through it, to irrigate the uterine cavity. The spoon-shaped end has a moderately sharp edge capable of removing the soft mucosa; the large size (*b*) has the advantage of being too large and blunt to be inadvertently pushed through the uterine wall; the small one (*a*) can, however, be directed more thoroughly into the uterine angles so that the endometrium of this part does not escape complete removal. The latter is therefore more efficient, and if carefully used it is not a dangerous instrument. The blunt curette made of stout wire may, however, be employed in exploratory curetting for suspected cancer of the body of the uterus, in which condition the tissues of the uterine wall are unusually friable, and perforation may readily occur (see p. 302).

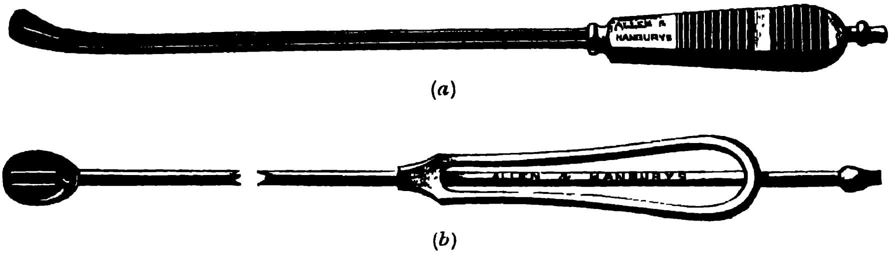

Fig. 248.—The Flushing Uterine Curette. The stem is channelled to allow of the uterine cavity being irrigated.

In scraping the uterus the entire wall should be systematically dealt with, the mucosa being removed in strips by pressing the edge of the curette firmly against the uterine wall and drawing it from the fundus down to the cervix. The uterine angles require special attention. The detached pieces *can be collected as they are washed away by the solution which pours freely out of the dilated* cervix. After completing the scraping, the uterine cavity may be dried with a probe or forceps covered with a thick twist of sterilised wool. Oozing may be free, and can usually be checked by raising the temperature of the flushing solution to 118° F., or by applying upon a uterine probe a strong antiseptic styptic, such as liniment of iodine, or iodised phenol (iodine, grs. 40, liquefied carbolic acid, 1 ounce). If this is not completely successful, a strip of sterile or antiseptic gauze may be passed up to the fundus and a tampon placed in the upper part of the vagina. The application of a strong antiseptic is always desirable in cases of chronic endometritis of infective origin.

The uterine wall may be *perforated* by the curette or, as is more likely, by the dilators, especially the small sizes. This accident is at once observed by the absence of resistance to the onward passage of the dilator after the proper limit has been reached. No bleeding results from perforation with a small dilator, and, if the operation has been aseptic and the uterus not previously infected, no harm follows. The operation can be completed, for the aperture is spontaneously closed by muscular contraction and by the elasticity of the tissues. If a septic uterus is thus perforated, one of two courses may be adopted; either the uterus should be at once removed, by the vaginal route if practicable, or the posterior fornix should be opened and free drainage *per vaginam* provided. The perforation is much more likely to occur in the lateral or posterior walls than the anterior; if in the lateral wall, the peritoneal cavity is not necessarily opened and the risks are consequently less serious.

In dilating a rigid cervix laceration at the internal os may occur so deep as to communicate with the broad ligament. This, again, does not as a rule cause severe bleeding, and is usually not observed unless the finger is introduced into the uterus.

Free *bleeding* after curetting is usually found to be the result of incomplete detachment of some new growth, such as polypus, the presence of which was unrecognised. The finger should always be introduced into the uterus for exploration in such cases, in order that the operation may be properly completed.

## *REMOVAL OF POLYPI*

**Cervical** polypi are very easily dealt with. Mucous polypi can be crushed in broad, blunt forceps and twisted off, their bases being afterwards seared with the actual cautery. Fibroid polypi generally have a stalked attachment to the wall of the cervical canal; the canal is already to some extent dilated, and the attachment of the stalk to the cervix may be cut through with scissors, without fear of subsequent bleeding. Or as an alternative, the polypus may be firmly seized with forceps and the stalk, if not too thick, torn through by twisting it. Mucous polypi of the cervix are so constantly accompanied by chronic glandular endometritis, that it is generally desirable to curette the uterus after removing the polypi.

**Uterine** polypi present greater difficulties. *Mucous* polypi are often removed by the curette; when attached to the angles of the uterus they may escape if the curetting is not thoroughly carried out (see fig. 124). They can be felt when the finger is introduced into the uterus, and special care can then be taken in curetting the part to which they are attached.

*Fibroid* polypi arising in the uterus may dilate the cervical canal and pass into the vagina, retaining their uterine attachment by a long pedicle, which may run up even to the fundus; as a rule its attachment is found to be to the lower part of the uterine wall. There is no difficulty in removing growths such as these if the pedicle is not too thick, by seizing the polypus in strong forceps and forcibly twisting it; or the stalk may be divided with curved blunt-pointed scissors passed along it into the uterus. The division should be made short of its actual base, and only gentle traction made upon the polypus at the time, so as to avoid all risk of cutting into, or perhaps actually button-holing, the uterine wall. Very thick stalks are best dealt with by first partly dividing them with scissors and then forcibly twisting through the remainder.

Fibroid polypi of considerable size may remain within the uterine cavity, and their removal is then more difficult, as the cervix cannot be sufficiently dilated to allow of their being withdrawn through it. The difficulty may be *surmounted in either of two ways: (1) by reducing the* size of the polypus before attempting its withdrawal; or (2) by enlarging the cervix, by incising it up to the level of the internal os.

In either case the cervix should be first dilated to the fullest extent, and in this case the preliminary use of a tent is helpful. Then the index finger is passed into the uterus and the size and relations of the polypus are determined. Next, the polypus is detached by division or twisting of its stalk. A sessile submucous fibroid, such as that shown in fig. 107, may be dealt with in the same manner as a polypus. The growth is first partly or completely shelled out of its mucous capsule with the tip of the finger, and then seized with forceps and twisted free from its bed. The loose growth being now firmly seized with strong toothed forceps may be cut up with knife or scissors, and the detached pieces removed. These manipulations are naturally difficult if the vaginal canal is narrow and the walls of the cervix are rigid.

By the alternative method, after dilating the cervix and exploring the growth with the index finger, a transverse incision is made across the cervix at the level of the anterior vaginal reflection, and the bladder detached by blunt dissection as in the first stage of vaginal hysterectomy (see p. 559). Then the anterior wall of the cervix is divided with scissors in the middle line from below upwards as high as the level of the internal os; this point is easily recognised by the abrupt enlargement of the canal which occurs when it is reached. The polypus is now detached and withdrawn through the opening in the vaginal fornix; it is important to avoid laceration or bruising of the vaginal walls, and if the aperture is not large enough it may be widened by carrying a short longitudinal incision from the centre of the transverse incision for about an inch down the anterior vaginal wall, after first carefully detaching the bladder from this position. After removal of the polypus the uterine walls should be curetted, as the endometrium is generally thickened in these cases.

Finally, the cervix is drawn down as low as possible with vulsellum forceps, and the uterine incision closed with interrupted chromic catgut sutures, care being taken that they embrace the upper end of the incision, and that all bleeding is controlled. The vaginal walls are then similarily united, and the vagina swabbed and closely packed with gauze. The application of strong styptics to the uterus is undesirable as they may tend to prevent union of the incisions by first intention.

## PLASTIC OPERATIONS ON THE CERVIX AND VAGINA

**Trachelorrhaphy.**—This operation consists in repairing lacerations of the vaginal portion of the cervix; almost invariably these injuries are sustained in child-birth. It is only when very deep or when associated with ectropion and erosion that they call for repair (see p. 200), and this operation, which was at one time much in vogue, is now seldom practised.

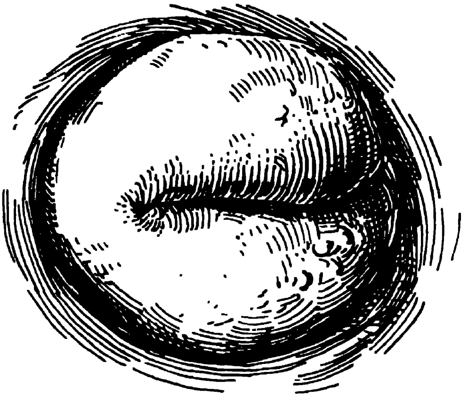

FIG. 249.—OBSTETRIC LACERATION OF THE CERVIX WITH EVERSION AND THICKENING OF THE LIPS OF THE OS.

The laceration is usually lateral (fig. 249), or bilateral, but unequal on the two sides; it may be tri-radiate or quite irregular. The sides of the gap in the cervix are first rawed by excising a narrow strip of tissue, which includes both vaginal and cervical mucous membranes; the strip taken must pass up to and include the base or angle of the laceration, where dense cicatrical tissue is always to be found. The raw surfaces are then brought together by interrupted stitches of stout chromic catgut; each stitch is entered about a quarter of an inch outside the edge on the vaginal surface and made to include the whole of the fibromuscular wall and the cervical mucosa; after passing thus through one wall of the tear, the suture enters the opposite wall on the cervical surface and leaves it on the vaginal surface about a quarter of an inch from the edge. The top stitch should firmly secure the angle, as this is the only situation in which bleeding occurs at all freely. In a bilateral case the lowest stitches should be passed so as to leave an external os of adequate size between them.

**Amputation of the Cervix.**—This procedure is required in

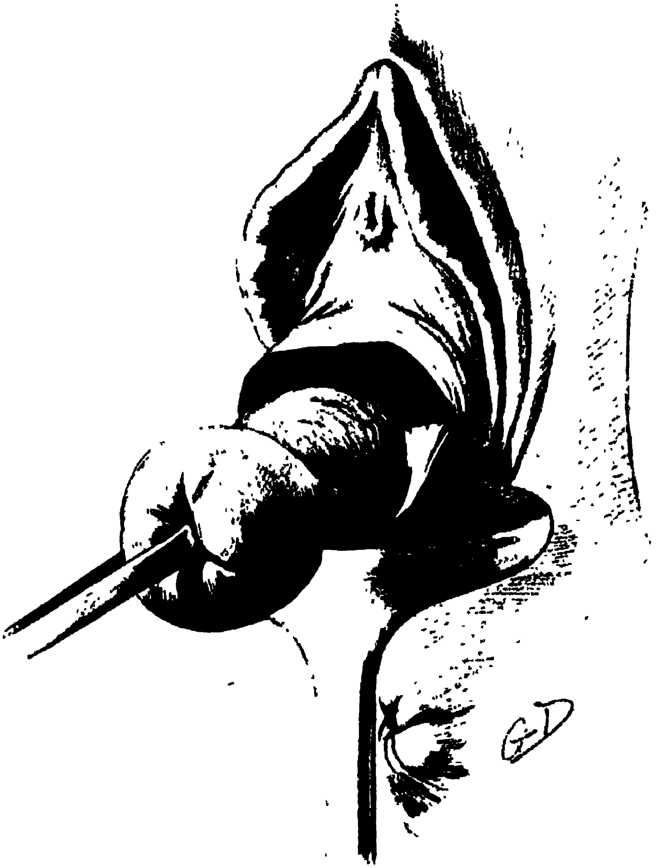

FIG. 250.—AMPUTATION OF THE CERVIX, FIRST STEP (Döderlein and Krönig). Reflecting the vaginal wall from the portion (supra-vaginal) to be amputated. *Note*—The thickness of the vaginal wall is exaggerated in the figure.

hypertrophic elongation of the cervix, existing either as an independent condition or associated with prolapse. There are several different methods of performing this operation, but the following will be found to be the most satisfactory.

The cervix having been suitably exposed and the bladder emptied by catheter, a pair of vulsellum forceps is placed on the anterior and another on the posterior lip. *First step.*—

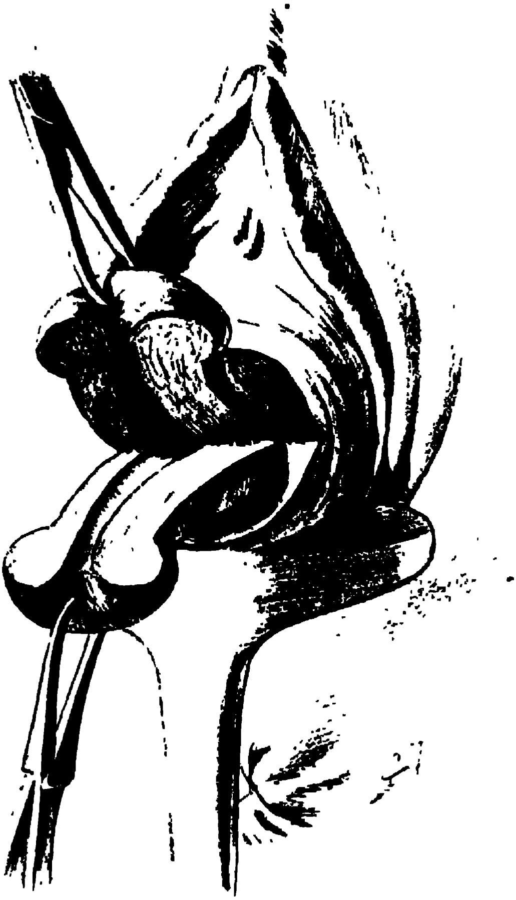

FIG. 251.—AMPUTATION OF THE CERVIX, SECOND STEP (Döderlein and Krönig). The denuded portion is first split into anterior and posterior halves and then cut away.

A curved incision is made across the front of the cervix reaching to a somewhat higher level at the sides than in the middle line (fig. 250). A similar incision is next made at the same level on the posterior lip joining up with the other at each side. If the elongation affects the supravaginal portion, the walls of the cervix are next cleared upwards by blunt dissection until a sufficient length has been isolated from its attachments. *Second step.*—The cervix is then divided into anterior and posterior flaps by a lateral incision on each side carried up to the point at which it is proposed to amputate (fig. 251) ; the two flaps are then cut away. *Third step.*—The operation is completed by stitching the reflected vaginal mucosa over the cut surface of the flap to the edges of the cervical canal in the

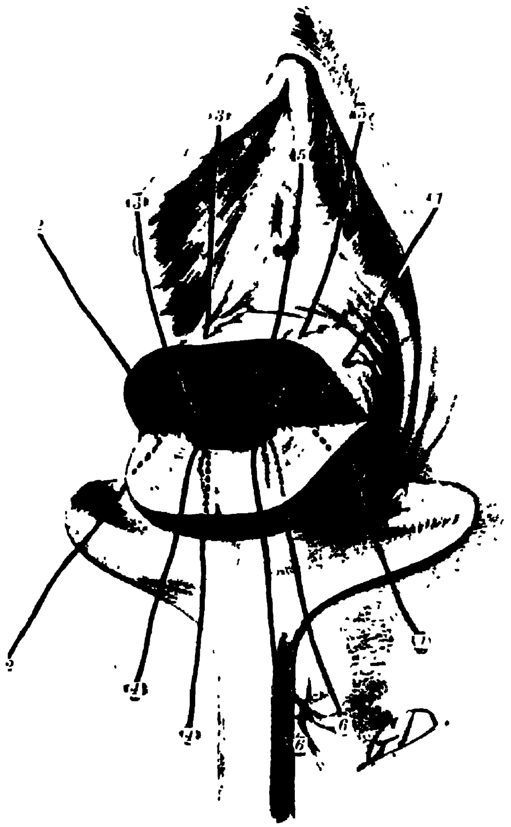

FIG. 252.—AMPUTATION OF THE CERVIX, THIRD STEP (modified from Döderlein and Krönig). Uniting the cervical and vaginal mucous membranes with deep stiches.

manner shown in fig. 252. The stitches should pass deeply through the tissues of the stump and not take up merely the two mucous membranes. The lateral stitches, numbers 1 and 2, are important in controlling hæmorrhage, for the vessels enter at the sides, they do not penetrate the cervical mucosa at all. Stitches 3 to 6 unite the cervical and vaginal mucous membranes around the truncated end of the canal. The best material for the sutures is chromic or iodine catgut of a fairly stout size, such as number three or four. All oozing must be completely controlled, and the vagina then lightly plugged with cyanide or iodoform gauze.

**Vesico-vaginal Fistula.**—This fistula is usually situated in the middle or upper third of the anterior vaginal wall. The operation suitable for moderate-sized fistulae, involving only the vaginal wall and bladder, is simple and easy. Occasionally large fistulae are met with in which the anterior lip of the cervix has also been destroyed by sloughing ; the operation necessary for the repair of an injury so extensive as this is complicated and cannot be described here.

Operations for vesical fistulae should not be undertaken while cystitis is present, for primary healing of the operation wound is then practically impossible. Irritation and infection of the vulvo-vaginal mucous membranes, so commonly met with, must be carefully treated, and as far as possible eradicated, by a course of hip-baths and douches before the operation is undertaken.

In order to obtain a good view of the anterior vaginal wall it is advisable to employ the elevated pelvic position shown in fig. 253. The posterior vaginal wall being then held back by a flat retractor the fistula can be well seen. Two different methods of closure may be practised ; in one the edges of the fistula are simply rawed and then stitched together ; in the other, a flap-splitting method, the bladder and vaginal wall are first separated from one another, and then separately united by distinct sets of stitches. The latter is the better method for all but fistulae of the smallest size, which may be successfully dealt with by the former.

(*a*) In rawing the edges of the fistula, a fine, keen, angled knife like those shown in fig. 254 is employed, and a narrow strip of tissue removed all round, which includes both bladder wall and vaginal wall, the latter being rather more freely removed than the former. Three strata of tissue are thus traversed, viz. vaginal wall, cellular tissue,

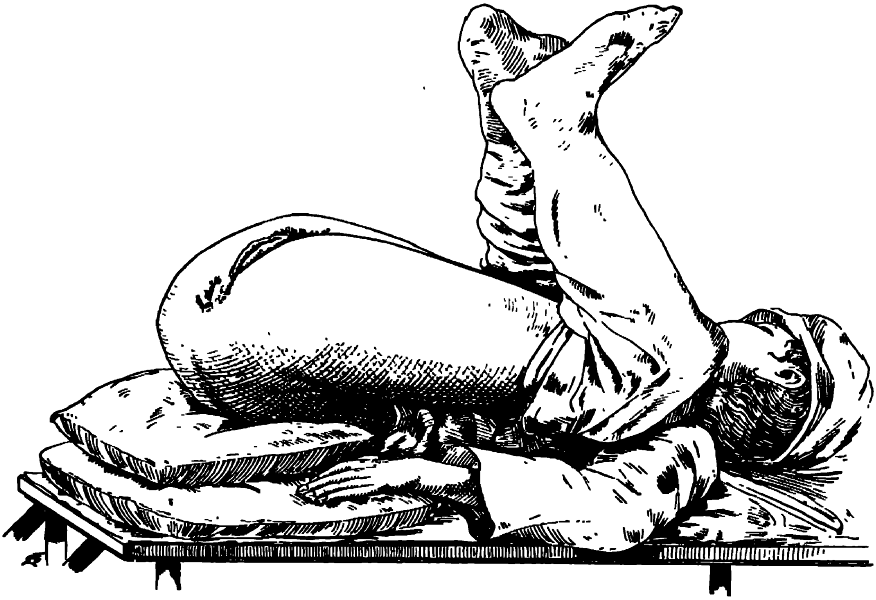

FIG. 253.—ELEVATED PELVIC POSITION FOR OPERATION FOR VESICO-VAGINAL FISTULA (after Kelly).

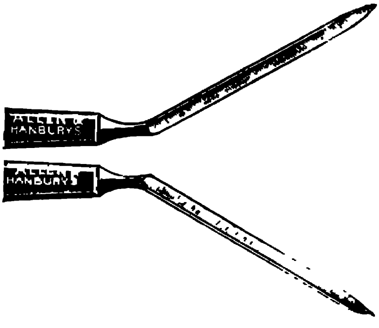

FIG. 254.—KNIVES FOR VESICO-VAGINAL FISTULA.

and bladder wall. Stout interrupted stitches are used to close the aperture, and these should be passed through all the tissues except the vesical mucosa, a good hold of the vaginal wall being required, as there is necessarily considerable tension. The rawed edges of the bladder mucosa are thus brought into apposition but not included in the stitches (fig. 255). Silkworm gut or silver wire are used by some operators; but chromicised catgut is the best material to employ, as it is much less likely to cut through the tissues, and does not require to be removed. The faults of this operation are: (1) that the edges of the fistula are held together under considerable tension, a condition unfavourable for healing by primary union; (2) that considerable oozing may subsequently occur from the bladder mucosa, sometimes filling up the bladder with blood.

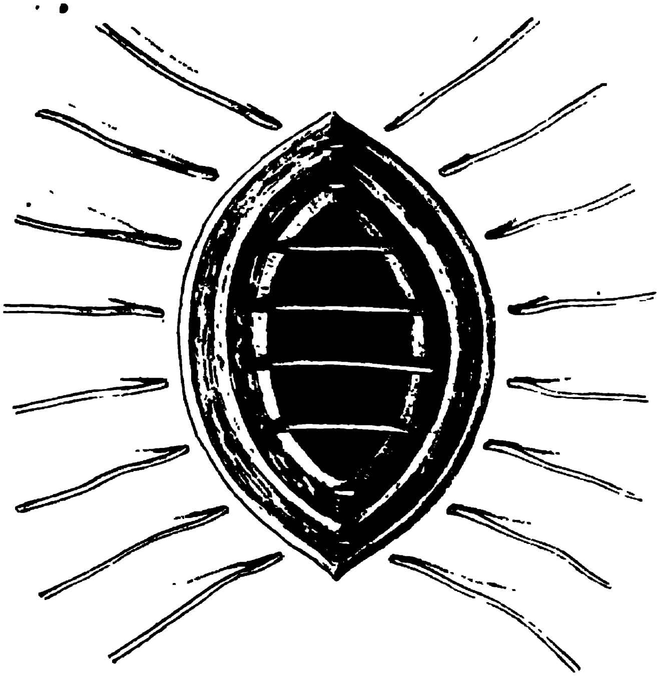

FIG. 255.—OPERATION FOR VESICO-VAGINAL FISTULA. The edges have been rawed, and the sutures introduced so as to include all the tissues except the mucous membrane of the bladder.

(*b*) In the flap-splitting operation an incision is made all round the fistula at about one quarter of an inch from its edges; from this incision two short longitudinal incisions are carried, one upwards towards the cervix and the other downwards towards the meatus (fig. 256). By means of these incisions the vaginal wall is then dissected carefully off the subjacent bladder, until the latter is exposed for half an inch all round the fistula. The edges of the opening in the bladder are not incised, but the opening is closed by a continuous catgut stitch passed just outside the edge through the muscular wall alone, on each side of the fistula as to bring muscular wall in apposition with muscular wall and invert the mucosa, in the manner of a Lembert's peritoneal suture. The

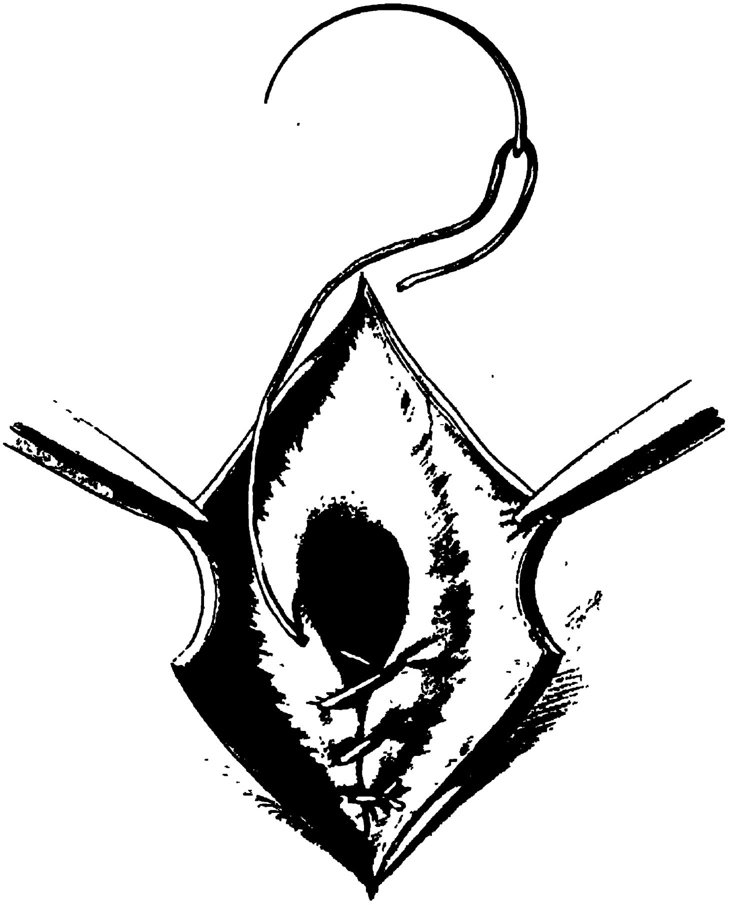

FIG. 256.—FLAP-SPLITTING OPERATION FOR VESICO-VAGINAL FISTULA. The vaginal flaps have been raised and are held aside by forceps. A catgut stitch is seen, which inverts the edges of the aperture in the bladder wall.

separation of the bladder from the vagina frees the former, and allows the edges of the opening to be drawn together with ease. A second series of interrupted stitches may then be similarly passed from side to side so as to bury the first stitch. The edges of the vaginal flaps are finally trimmed and united accurately by catgut stitches so as to completely cover up the bladder walls.' The advantages of this method are: (1) absence of tension; (2) strengthening of the bladder wall by superimposed layers of sutures; (3) better protection of the bladder stitches from vaginal infection.

A catheter should be retained in the bladder for five or six days after either operation; diluents should be given freely to prevent over-acidity of the urine, and careful vaginal asepsis must be observed, as primary union of the vaginal stitches is an important element of success.

## PERINEORRHAPHY

Plastic operations for repair of perineal lacerations of some standing are alone included under this designation; the repair of recent lacerations is considered as an obstetric procedure. Many different operative measures have been devised, and have been practised with success; in all the basis is either *denudation* or *flap-splitting*, or a combination of the two. In denudation strips of mucous membrane from the recto-vaginal septum are removed to provide a raw area of the required size and shape. In flap-splitting no tissue is sacrificed, but the recto-vaginal septum is split by raising from it an anterior flap, thus providing the raw area required for repair. When the perineal laceration is *complete*, i.e. involving the anus, or sometimes as much as one-half to one inch of the anal canal, the operation is more complex than when the laceration is incomplete. Where the ostium vaginae has been greatly relaxed by parturition, although the perineal body is very little injured, the clinical results are the same as in true perineal laceration, and similar operative treatment is required.

**Complete Laceration.**—In this condition, as shown in fig. 257, the anal and vaginal apertures are brought close together through the disappearance of the intervening perineal body;

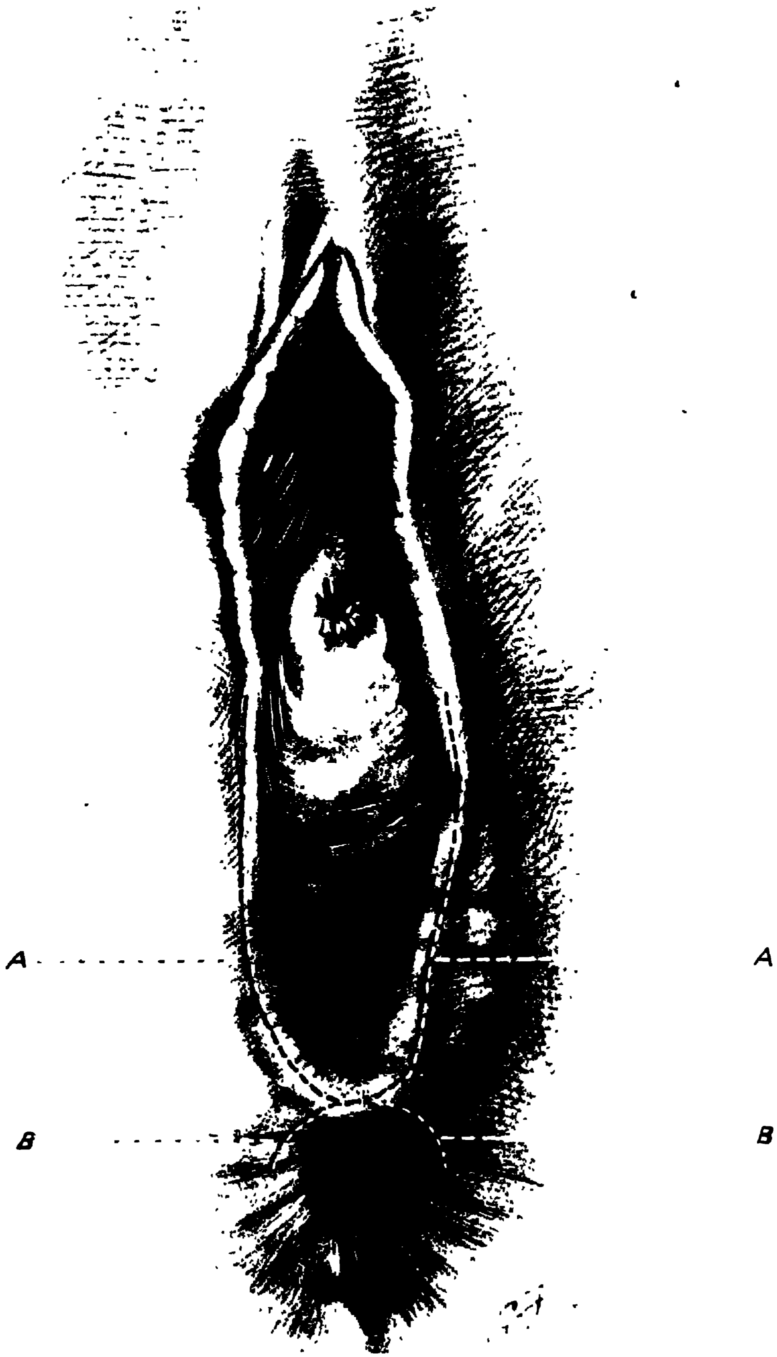

FIG. 257.—COMPLETE PERINEAL LACERATION. The perineal body is absent, the vulva patulous, and the anterior vaginal wall prolapsed (cystocele). The anus is gaping, and the radial cutaneous folds are absent anteriorly. The dotted lines represent the incisions by which the vaginal and anal flaps are raised.

the lower part of the recto-vaginal septum is greatly attenuated, and the anus is permanently relaxed from laceration of the anterior fibres of the superficial sphincter. The ends of the torn sphincter retract so that the muscle is horse-shoe shaped instead of circular; the position of the retracted ends is usually indicated by a shallow depression on each side, the two ends frequently lying not in the same transverse plane. The aim of the operation is to reconstruct the perineal body, and to restore the competence of the anus by repairing the anal canal and re-uniting the retracted ends of the sphincter.

*First step—Raising the flaps.*—Four incisions radiating from the ano-vaginal septum as indicated in fig. 257 are required; incisions B, B allow of short flaps being raised from the anterior half of the enlarged anal aperture (***anal flaps***); incisions A, A form the lateral and lower borders of the flap which is to be raised from the posterior vaginal wall (***vaginal flap***). The incisions A, A are made in the transition line between skin and mucous membrane, and are carried forward towards the pubes as far as may be necessary sufficiently to close the ostium vaginae—at least up to the posterior ends of the nymphae. The flaps are most conveniently raised with sharp-pointed angled scissors (fig. 258), and as the recto-vaginal septum is thin, care must be taken not to injure the rectal wall. When the amount of injury to the anus has been considerable, eversion of the rectal mucous membrane along the anterior part of the anal aperture is often seen; in raising the anal flaps the incision should be so made as to include the redundant portion of the mucous

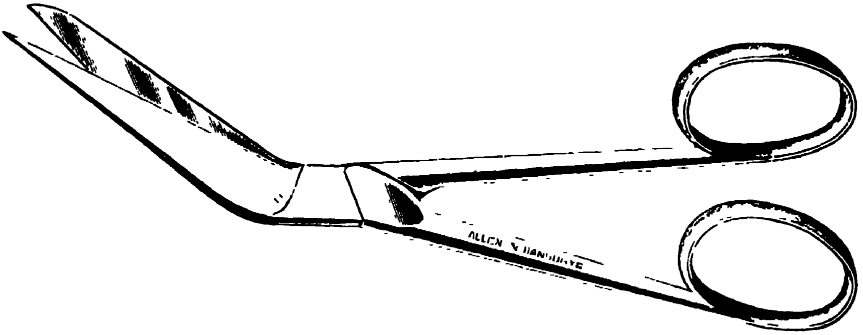

FIG. 258.—ANGLED SCISSORS FOR PERINEORRHAPHY.

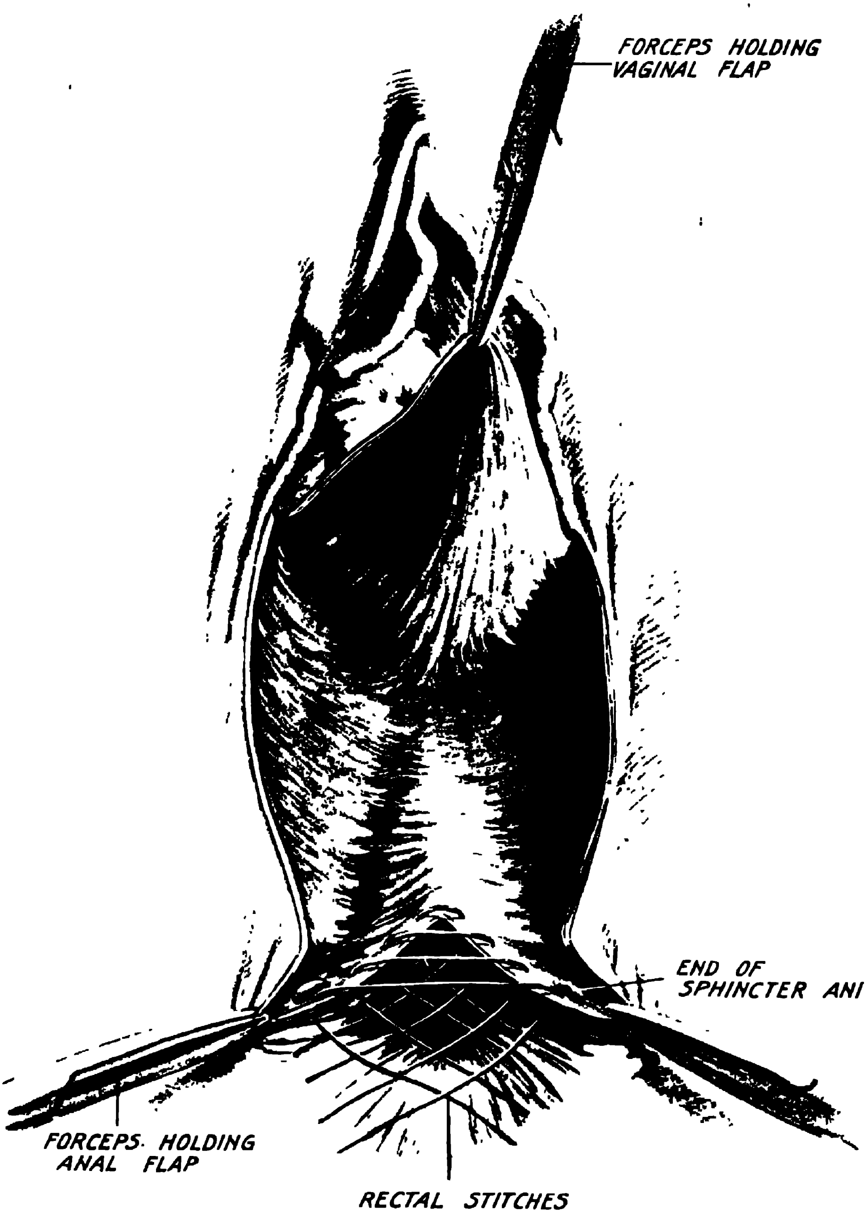

FIG. 259.—PERINEORRHAPHY FOR COMPLETE LACERATION. The long vaginal flap has been raised, the dissection having been carried deeply into the antero-lateral angles. The short anal flaps have also been raised, and the rectal stitches introduced; the latter are represented as not tied in order to show their relations; they should be tied as introduced from above downwards.

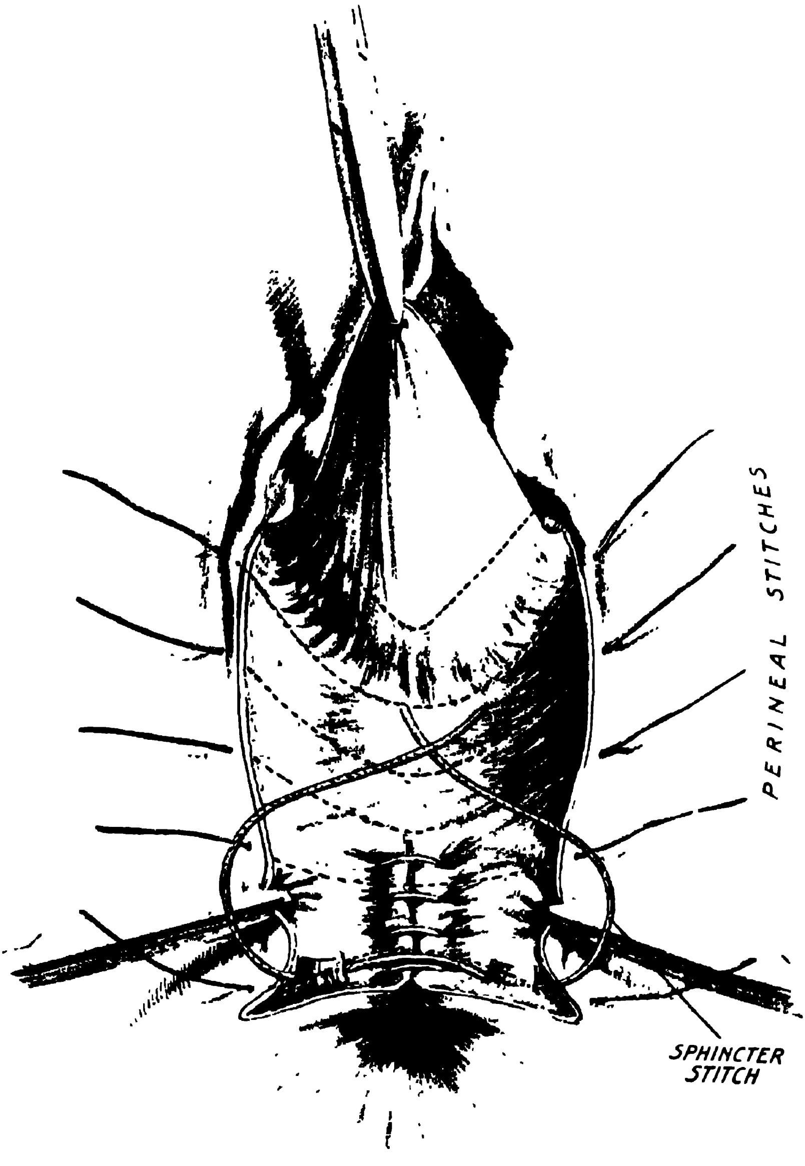

Fig. 260.—Perineorrhaphy for Complete Laceration. The rectal stitches have been tied, the knots being concealed in the rectum. The sphincter stitch has been introduced but not tied. The perineal stitches also have been introduced but not tied. The dotted **V**-shaped line in the base of the vaginal flap indicates where this flap is to be cut away.

membrane, which is afterwards clipped away from the edges of the flaps. In raising the vaginal flap free venous bleeding usually occurs, and when the rectal wall is closely approached the large veins of the inferior hæmorrhoidal plexus may give rise to a good deal of trouble. When the recto-vaginal septum is very thin the raising of the vaginal flap is made easier by passing the index finger into the rectum, which enables the operator to keep clear of the rectal wall. A rubber finger-stall may be slipped on the gloved index for the rectal manipulation. Bleeding points should be secured with catgut as far as is practicable, but there is considerable diffuse oozing, which may be reduced by irrigating with hot saline solution, but can only be controlled by the deep stitches. In raising the vaginal flap the dissection must be carried deeply at the two antero-lateral angles, as shown in fig. 259.

*Second step—Repairing the anal canal.*—This consists, firstly, in uniting the raw edges of the anal incisions, and secondly in bringing together the separated ends of the superficial anal sphincter. The positions in which stitches are to be placed is shown in fig. 259; interrupted stitches of chromicised catgut, tied with the knots in the anal canal, give the best results; they are introduced from above downwards, tied at once, and the edges adjusted as accurately as possible. The ends of the sphincter are then sought for, their position having previously been noted upon the skin surface. Sometimes they can be readily seen, as shown in fig. 259, in which the appearances are somewhat exaggerated; when not definitely identified, the stitch may be passed, so as to take up a good hold of the tissues in which the muscle lies embedded. This *sphincter stitch* is entered within the margin of the reflected anal flap, and passed beneath the end of the sphincter; then it crosses above the line of the rectal stitches and is passed beneath the end of the sphincter on the opposite side, emerging within the edge of the anal flap (fig. 260). When tied this suture is therefore buried, like the rectal stitches. It should not be tied until the perineal wound is finally closed.

*Third step—The perineal stitches.*—In this step the perineal body is restored by drawing together the lateral edges of the raw area left by raising the vaginal and anal flaps. Four or five stitches are required, as shown in fig. 260.

The anterior stitch is necessarily deeper than the others, and, owing to the amount of tissue which it is made to embrace, is subject to considerable tension. It must therefore be carefully and accurately passed. The stitch is made to enter about one-eighth of an inch outside the anterior extremity of the lateral cut edge, and passed through the tissues of the base of the vaginal flap to emerge at a corresponding point upon the skin of the opposite side. It is thus made to describe a curved course in which it passes deeply into the vagina, and should be completely buried so that no part is seen between the points of entrance and exit. Its introduction can be guided by the finger passed over the vaginal flap into the vagina. This stitch secures a firm hold upon the vaginal wall in the angle of reflection of the vaginal flap, and when tied will draw this part of the vaginal wall downwards and forwards to the ostium vaginae, where it will form the anterior part of the reconstructed perineal body. The anterior stitch can be introduced with a special curved needle such as those shown in fig. 261, or with a widely curved Bonney's needle held in forceps or a needle holder. The best suture material is silkworm gut for stitches which must sustain tension, and chromicised catgut for those which, like the posterior ones, have little tension to bear.

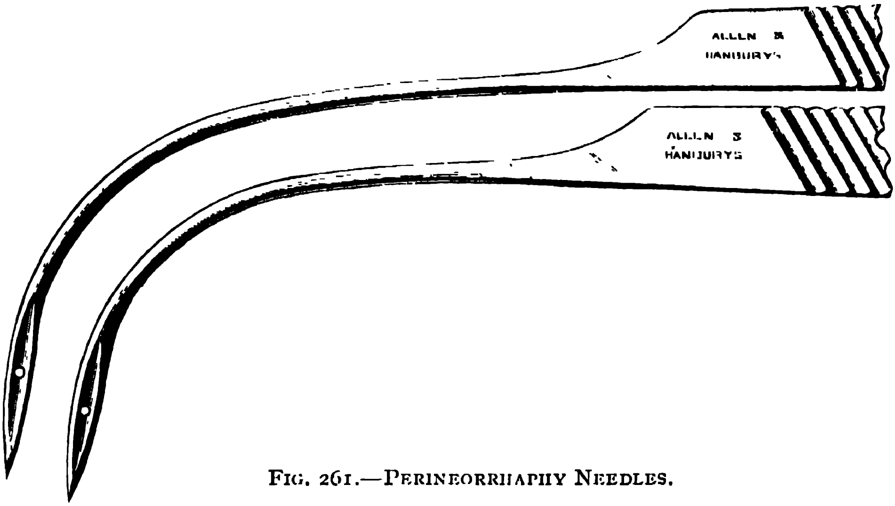

FIG. 261.—PERINEORRHAPHY NEEDLES.

Three or four other sutures are similarly passed at intervals

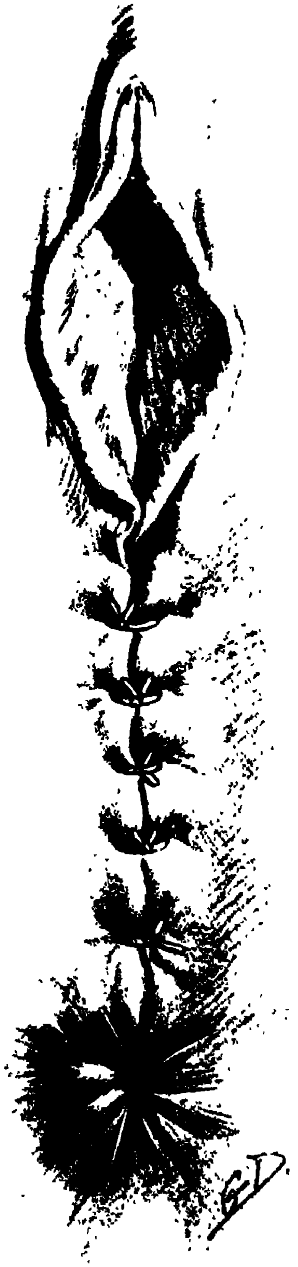

Fig. 262.—Perineorrhaphy for Complete Laceration. The perineal stitches have been tied. The ostium vaginae is greatly reduced in size, the perineal body and the anus are restored.

of one half inch behind the anterior one; the posterior stitch draws together the anal flaps, and so covers in the sphincter stitch introduced at a previous stage of the operation. All these stitches should be buried in the tissues of the raw area so that a firm hold is obtained; it is not sufficient merely to draw the skin edges together over the raw area, for this would not restore the bulk of the recto-vaginal septum.

The vaginal flap will be found to have shrunk considerably after being reflected. Before the anterior perineal stitch is tied, this flap should be reduced if redundant, by excising a wedge-shaped portion (fig. 260); the edges are then united with a catgut stitch carried from the apex down to the base.

Finally a dressing consisting of a firm thick pad of antiseptic gauze and wool should be applied, and fixed with a T bandage in such a way as to exert firm pressure upon the operation area. This assists in preventing deep oozing from taking place, and so avoids the formation of a hæmatoma.

The bladder should be emptied by catheter three or four times every twenty-four hours for the first three days, and great care is required in nursing to keep the parts as clean and dry as possible. A morphia suppository is the best means of relieving pain after the operation. The bowels should be moved on the morning of the third or fourth day by means of castor oil, an enema of four ounces of olive oil being administered an hour after the aperient has been taken. Silkworm gut stitches should be removed on the tenth day. The patient should be kept lying down for three weeks.

In cases of *incomplete* perineal rupture, or of relaxed vaginal outlet (fig. 77), a similar operation may be performed; anal flaps are not required, but the vaginal flap is raised and the operation completed in the manner just described.

## ANTERIOR COLPORRHAPHY

This operation consists in excising an area of the mucous membrane of the anterior vaginal wall so as to effect a reduction in its length and breadth, the indication for its performance being prolapse of the anterior vaginal wall or cystocele. This condition is often complicated by perineal laceration, and by prolapse of the uterus; colporrhaphy must under such circumstances be combined with other operations such as perineorrhaphy or

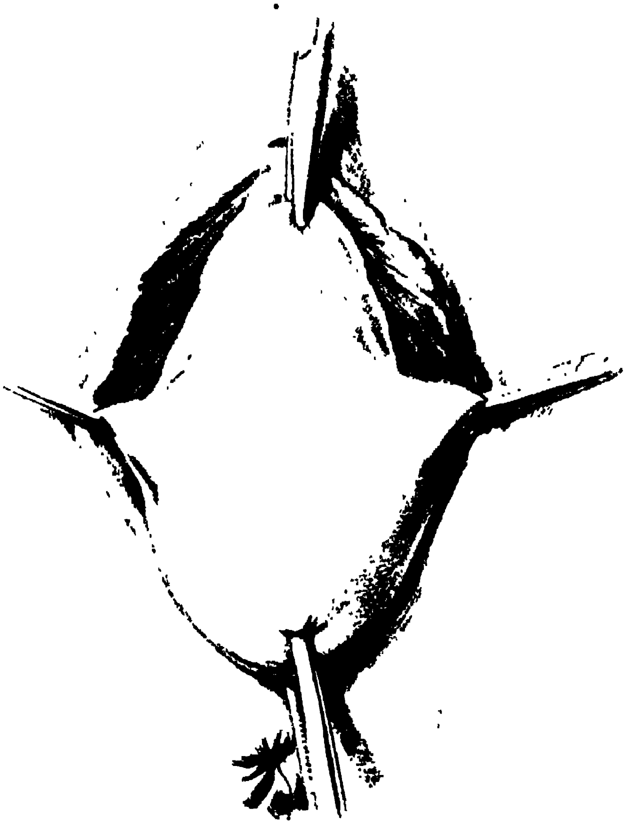

FIG. 263.—ANTERIOR COLPORRHAPHY. Marking out the limits of the diamond-shaped flap which is to be raised from the vaginal wall.

ventrifixation, for cure of the cystocele is impossible unless these complications are also dealt with.

The anterior vaginal wall having been exposed with a suitable speculum, the area of mucous membrane to be removed is first defined with forceps; this may be oval or diamond shaped, the long axis being vertical and extending from a point an inch below the cervix to a point an inch above the meatus (fig. 263). The flap is then marked out with a knife by an incision deep enough to divide the mucous membrane only, and running from one forceps

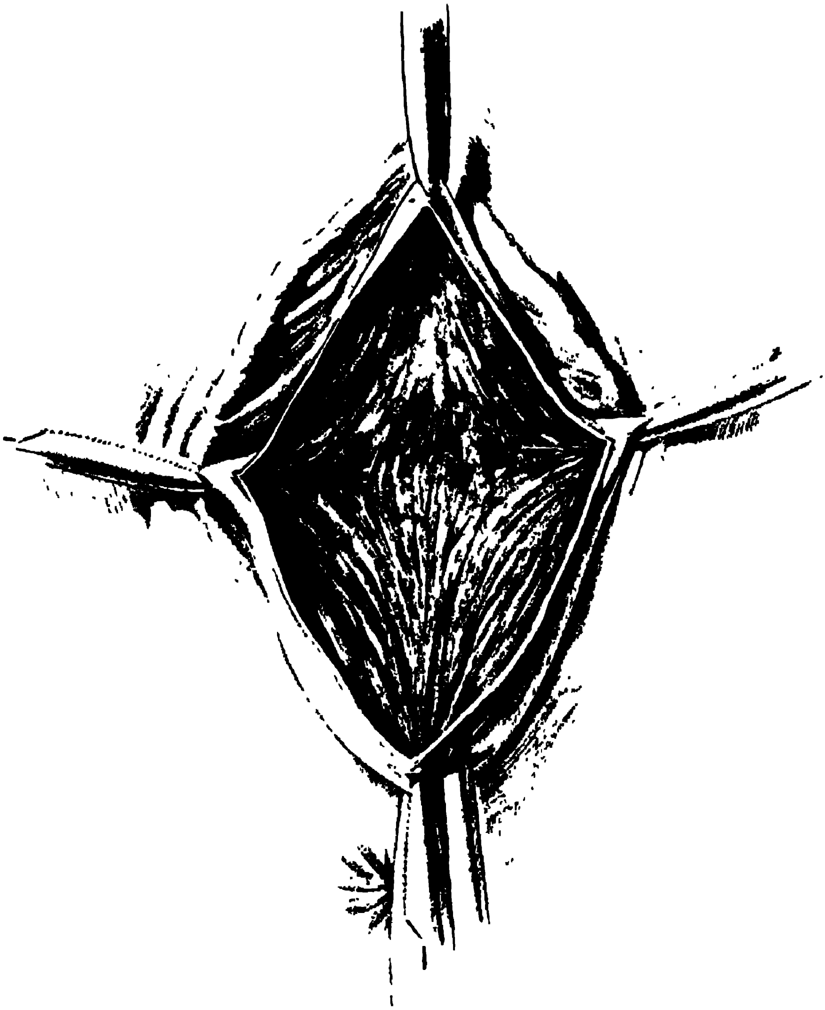

FIG. 264.—ANTERIOR COLPORRHAPHY. The raw surface left after the vaginal flap has been raised.

point to another; with sharp pointed scissors or knife the flap is raised from the subjacent bladder and cut away. A raw area is then left, as shown in fig. 264. After tying all bleeding points with fine catgut, the raw area is closed by superimposed tiers of buried catgut sutures, running *transversely* and thus gradually inverting the exposed bladder wall, and approximating the two upper sides of the diamond to the two lower sides. Finally a continuous stitch accurately unites the edges of the vaginal mucous membrane, the resulting cicatrix running from side to side (fig. 265). It is obvious that it would be equally possible to close the raw area with stitches passed in the longitudinal plane, so as to give a cicatrix running from above downwards instead of from side to side. The transverse cicatrix is preferable, for being at right angles to the plane in which the bladder

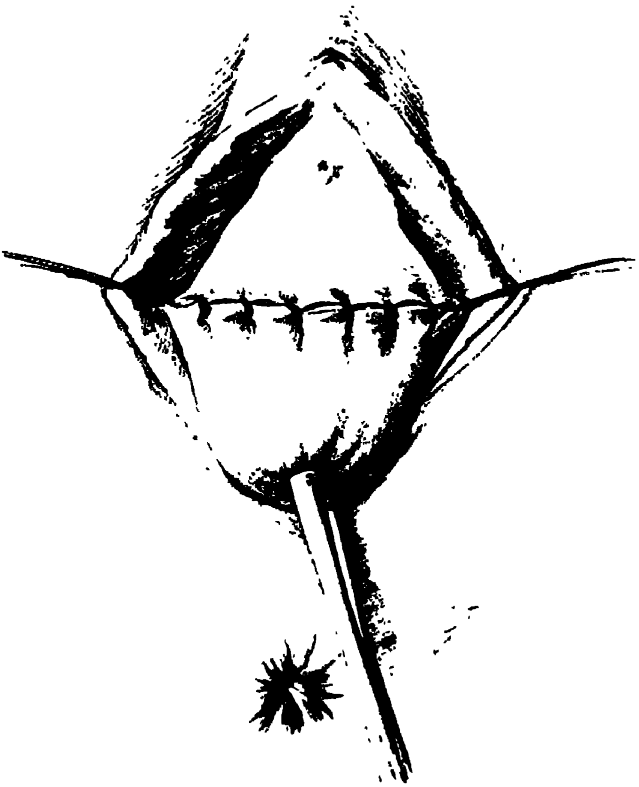

FIG. 265.—ANTERIOR COLPORRHAPHY. Showing the continuous stitch with which the edges are finally brought together.

will descend when prolapsed, it offers more effectual resistance.

*Posterior Colporrhaphy.* In cases of rectocele a similar operation to that just described may be carried out on the posterior vaginal wall, and combined if necessary with perineorrhaphy.

## COLPOTOMY

This operation consists in making an incision through the anterior fornix so as to open the utero-vesical pouch (anterior colpotomy), or through the posterior fornix so as to open the pouch of Douglas (posterior colpotomy). The object of the operation is to evacuate collections of blood or of inflammatory fluids in these pouches, or sometimes to remove new growths of small size such as ovarian cysts, or to open and drain tubal or ovarian collections of pus in acute suppurative inflammation of the uterine adnexa.

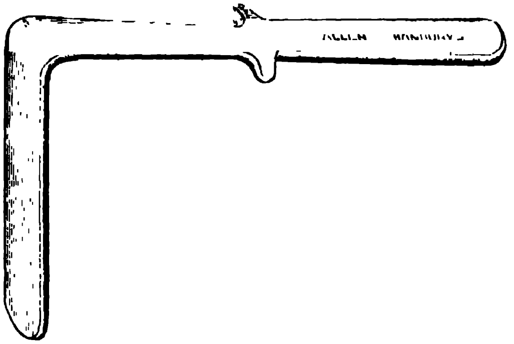

FIG. 266.—FLAT VAGINAL RETRACTOR.

**Posterior Colpotomy.**—The cervix is exposed with a flat vaginal retractor (fig. 266), or with Auvard's speculum, and the posterior lip seized with a pair of vulsellum forceps and drawn forwards so as to expose the posterior fornix (fig. 267). A transverse incision an inch and a half long is then made about an inch above os externum; this divides the vaginal mucous membrane and opens up the cellular tissue plane in the floor of the pouch of Douglas. The finger is then passed through the incision and the tissues picked up with forceps close to the posterior wall of the uterus, and carefully divided with scissors. In this manner the peritoneum is reached and opened

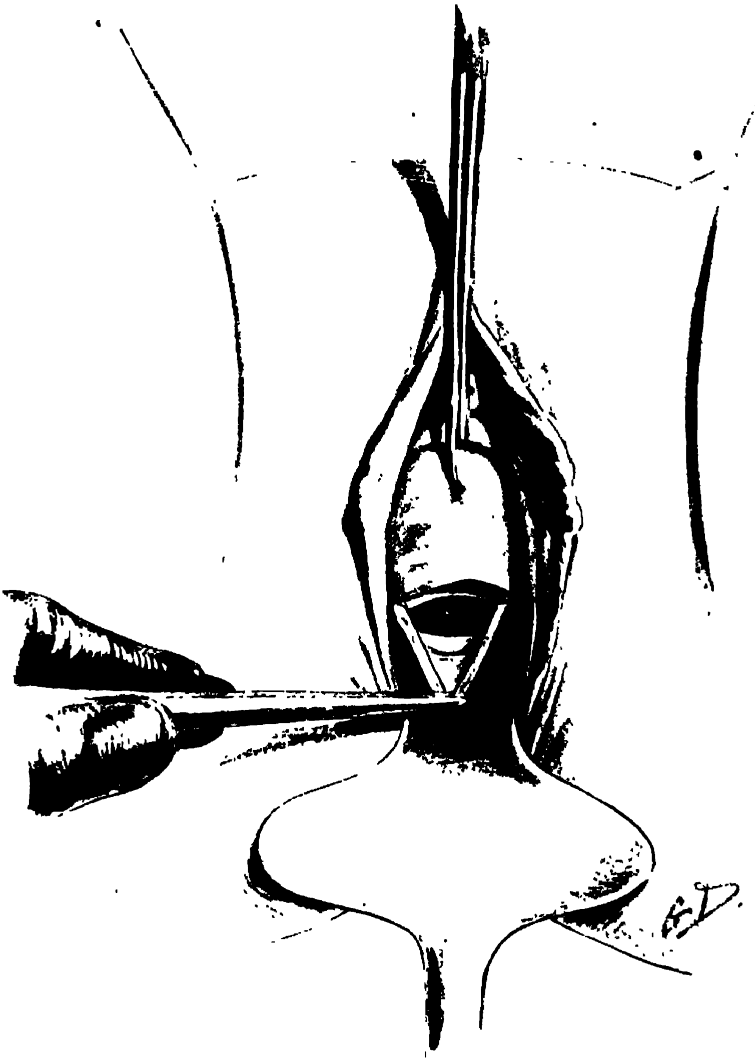

FIG. 267—POSTERIOR COLPOTOMY (Wertheim and Micholitsch). The posterior lip of the cervix has been drawn forwards so as to expose the posterior fornix. This has been laid open by a transverse incision.

at a variable depth, but by keeping close to the uterus all risk of injuring the rectum will be avoided. The opening into the peritoneum may be enlarged by the finger or by a pair of blunt forceps until it is as large as the incision in the vaginal wall. There is, as a rule, little hæmorrhage, but sometimes bleeding points on the cut edge of the vaginal wall require a stitch.

When *collections of fluid* are present in the pouch of Douglas, they may be tapped with the trochar shown in fig. 268 as soon as the vaginal mucous membrane has been divided. This instrument consists of a strong stilette held in a special pair of forceps grooved suitably to hold it. The instrument is pushed through the wall of the collection of fluid, and then upon opening the forceps the stilette is released and can be withdrawn. By separating the blades of the forceps, the opening can afterwards be enlarged to the desired extent. The finger is now passed into the cavity for exploration of its walls, and in chronic cases, where the fluid has been effectively isolated by adhesions, it may be douched with a sterile saline solution to wash away blood clot or purulent material. This should not be done in recent or acute cases, lest infective material be carried upwards by the fluid into parts previously unaffected. Drainage may be provided for by loosely packing the cavity with gauze, or by introducing a rubber drainage tube and stitching it to the edge of the vaginal incision to retain the tube in position. The opening tends to close rather rapidly, and it may be necessary to pass the finger through it from time to time to keep it patent.

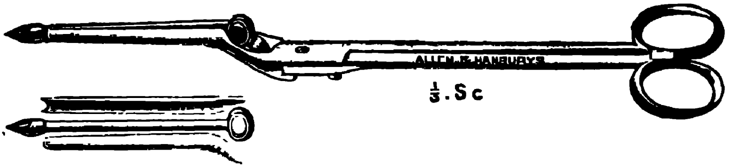

FIG. 268.—MARTIN'S PELVIC TROCHAR.

**Anterior Colpotomy.**—In this procedure a transverse incision is made across the anterior fornix, just below the lower limit of the bladder, which should first be carefully defined with a sound. The incision is necessarily made much nearer the external os than in posterior colpotomy. The bladder is then separated from the cervix as described on p. 559, until the peritoneum is finally reached. It lies at a much deeper level than that of the posterior pouch. With the finger in the wound and directed towards the uterus, the smooth peritoneal surfaces can be felt to slide over one another when the floor of the utero-vesical pouch has been reached (fig. 269). The peritoneum is now picked up with

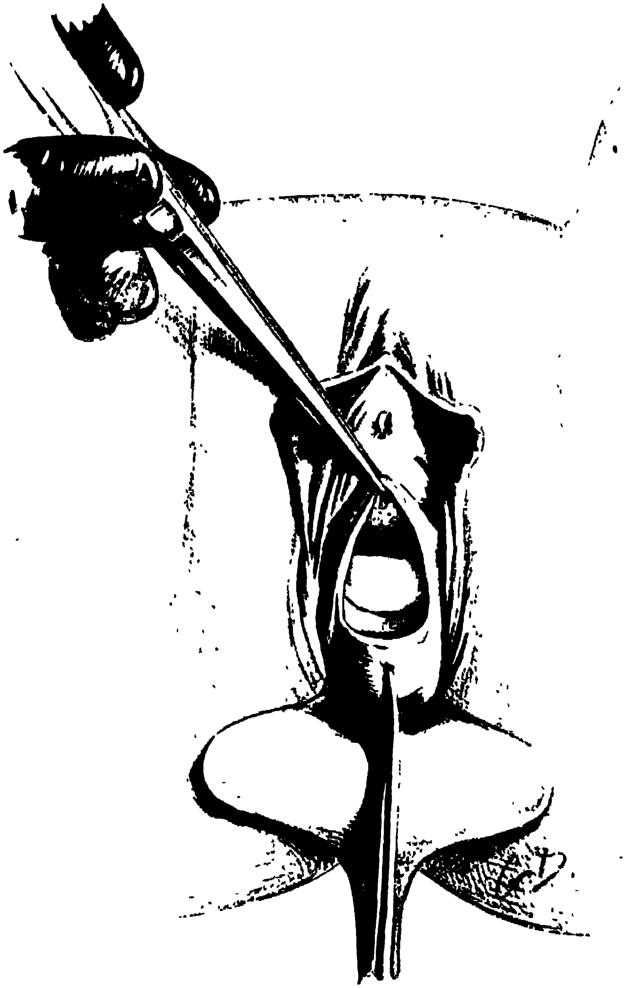

FIG. 269.—ANTERIOR COLPOTOMY (Wertheim and Micholitsch). The anterior lip of the cervix has been drawn backwards so as to expose the anterior fornix. This has been laid open by a transverse incision; the unopened utero-vesical peritoneum is seen within.

forceps, and divided close to the uterine wall so as to avoid the bladder.

This operation is much less frequently required than posterior colpotomy, since collections of blood and of inflammatory fluids are much more commonly found in the posterior than in the anterior peritoneal pouch.

## VAGINAL FIXATION OF THE UTERUS

This operation was introduced as a means of correcting backward displacement of the uterus. It consists in opening the utero-vesical pouch as in anterior colpotomy, and then anteverting the uterus and stitching the anterior surface of the body to the edges of the incision in the vagina, the bladder being thus displaced from its normal relation to the cervix. The results do not compare favourably with those obtained by the operation of ventrifixation already described (p. 563).

More recently a modification of this operation has been introduced by Wertheim, and adapted for cases of severe prolapse. Briefly, the operation consists in separating the whole of the bladder from the anterior vaginal wall by a long median incision, extending from the cervico-vaginal reflection to a point about one-and-a-half inches above the urinary meatus; the utero-vesical pouch is then opened as in anterior colpotomy. The fundus of the uterus is then drawn through the incision into the vagina, and the peritoneum of the utero-vesical pouch stitched to that covering the posterior wall of the uterus, so as to once more close the peritoneal cavity. The redundant part of the anterior vaginal wall is next cut away and the edges are then brought together over the front of the uterus, which is fixed to the vaginal wall by several strong sutures. The uterine body is thus greatly anteverted, and lies between the anterior vaginal wall and the bladder, which has been displaced upwards.

This operation is of service in procidentia occurring in women who have passed the menopause; in its strongly anteverted position prolapse of the uterus is impossible, and cystocele is equally incapable of being produced. Supplemented by perineorrhaphy when the vulva is dilated or the perineum deficient, the results are good. In young women this operation is seldom justifiable, as pregnancy cannot be allowed to occur with the uterus in the abnormal position described ; the operation may, however, be made practicable in such cases by sterilizing the patient at the same time by excising the Fallopian tubes ; this can be done through the colpotomy incision without difficulty.

# PART XIV

## AFTER-TREATMENT OF MAJOR OPERATIONS

It will be convenient to consider the management first of the uncomplicated convalescence, and then of the more common complications which may arise.

### UNCOMPLICATED CASES

One or two doses of morphia ($\frac{1}{4}$ gr. to $\frac{1}{3}$ gr.) or of heroin (gr. $\frac{1}{12}$) may be given hypodermically during the first twenty-four hours, to relieve pain and restlessness. Anæsthetic vomiting is in some cases severe and persistent, the rejected stomach fluids being thin and greenish in colour; this vomiting may continue for twenty-four to thirty-six hours in exceptional cases, but there is no acceleration of the pulse or rise of temperature accompanying it. A teacupful of warm water, in which half a teaspoonful of bicarbonate of soda has been dissolved, usually relieves this form of vomiting and may be repeated if necessary; being almost immediately returned, it washes out the stomach and diminishes the acidity of its secretions. Stomach-feeding must be avoided until the vomiting has ceased, but rectal enemata of normal saline solution may be given to relieve thirst.

A rise of temperature to 100° F., or higher, is often noted at the beginning of the second day. A good deal of discomfort and colicky pain from flatulent distension of the intestines inevitably occurs on the second and third days. This can be entirely relieved only by early purgation; the author's practice is to give a large soap-and-water enema with half an ounce of turpentine twenty-four hours after the operation, which results in the passage of flatus freely, and to follow it up by administering an aperient so that free action of the bowels may be secured within forty-eight hours. Pending the action of the purgative, the passage of flatus may be encouraged by inserting a rectal tube of soft rubber and leaving it in position for half an hour. The best aperient is four to five grains of calomel given in divided doses of one grain every hour, and followed by a saline such as the Mist. Alba of hospital pharmacopæias, a seidlitz powder, or a dose of mineral water such as Apenta; the dose of saline may be repeated if necessary. After the bowels have been freely moved the abdominal pain and discomfort disappear.

Thirst is always complained of during the first two or three days, and is aggravated when morphia has been administered. It is unnecessary to withhold water, which may be given hot in quantities of one to two ounces, as soon as the anæsthetic vomiting has ceased. A half a pint of normal saline solution slowly injected into the rectum, and repeated in two or three hours, will relieve thirst to a considerable extent, although the feeling of relief is not so complete as when fluid is drunk. Milk and barley water, or a cup of weak tea with milk, may be given after twelve to eighteen hours, if vomiting is absent. After the bowels have been moved, light solid food, such as toast, fish or pounded chicken, is tolerated better than a purely liquid diet.

After consciousness has been recovered, the patient's position may be changed from time to time, and this adds greatly to her comfort; she may be turned on her side, or propped up in the semi-sitting (Fowler's) position instead of being compelled to lie continually upon her back.

Temperature and pulse should run a normal course after the third or fourth day if all is going well. The dressing need not be disturbed unless some special indication for doing so arises, the stitches being removed on the seventh or eighth day and the scar covered with a collodion dressing.

In the case of nearly all the intra-peritoneal operations upon the pelvic organs, slight hæmorrhage from the uterus occurs (metrorrhagia) for the first day or two of convalescence. It is, no doubt, the result of circulatory disturbances induced by ligature of large vessels in the broad ligaments. After myomectomy for deeply-seated interstitial growths, bleeding may occur to much greater extent than after any other procedure; it is probably due to some injury sustained by the endometrium. No treatment is required.

## COMPLICATIONS

**Shock.**—The essential feature of post-operative shock is profound depression of the circulation, indicated by cardiac feebleness and low blood pressure. It is present to a moderate extent after all severe intra-peritoneal operations; in different circumstances many different degrees of severity are observed, and in some cases the patient may die of shock without recovering consciousness. The conditions which may be expected to lead to severe shock are great loss of blood, chilling of the body and especially of the abdominal viscera by exposure when under anæsthesia, rough handling of the abdominal organs, prolonged anæsthesia, and a precedent loss of vitality from illness. To a great extent these predisposing causes can be avoided by careful management, but not of course in all cases. After all severe abdominal operations a pint of normal saline solution may be poured into the peritoneal cavity and left for absorption; this diminishes shock and relieves thirst.

Shock, when severe, is clearly manifested before the effect of the anæsthetic has passed off, and while the patient is still unconscious. The skin is pale and cold, and the lips are slightly cyanotic; sometimes a cold sweat is found, especially upon the face and the palms of the hands. The pulse is rapid, small, and very feeble, the temperature sub-normal, the respiration shallow and usually not increased in rapidity. The mental condition is lethargic; and although the patient can be roused she rapidly becomes again somnolent. Sometimes these conditions supervene somewhat suddenly after an interval, when consciousness commences to return. The main distinction between profound shock and the effect of profuse hæmorrhage is that, in the latter, the patient becomes restless and excited, and the breathing is laboured and rapid (air-hunger).

Shock may continue for many hours in spite of treatment, and sometimes all attempts at restoration fail and the patient dies. Usually, however, a gradual reaction sets in, the pallor diminishes, the surface of the body becomes warmer, the temperature rises, and the pulse becomes stronger and more rapid.

The *treatment* consists in endeavouring to restore the circulation by wrapping the patient's body in warm blankets, and maintaining heat with hot bottles, which, however, must be very carefully shielded from contact with the patient's skin. In addition a rectal enema consisting of a pint of warm normal saline solution may be administered, and the foot of the bed raised ten to twelve inches above the head. A temporary rise of blood-pressure may be produced by the hypodermic administration of small doses of adrenalin or pituitary extract (see p. 113), but the researches of Crile have shown that strychnine, formerly so much employed in shock, aggravates rather than improves the condition. Severe cases require in addition the

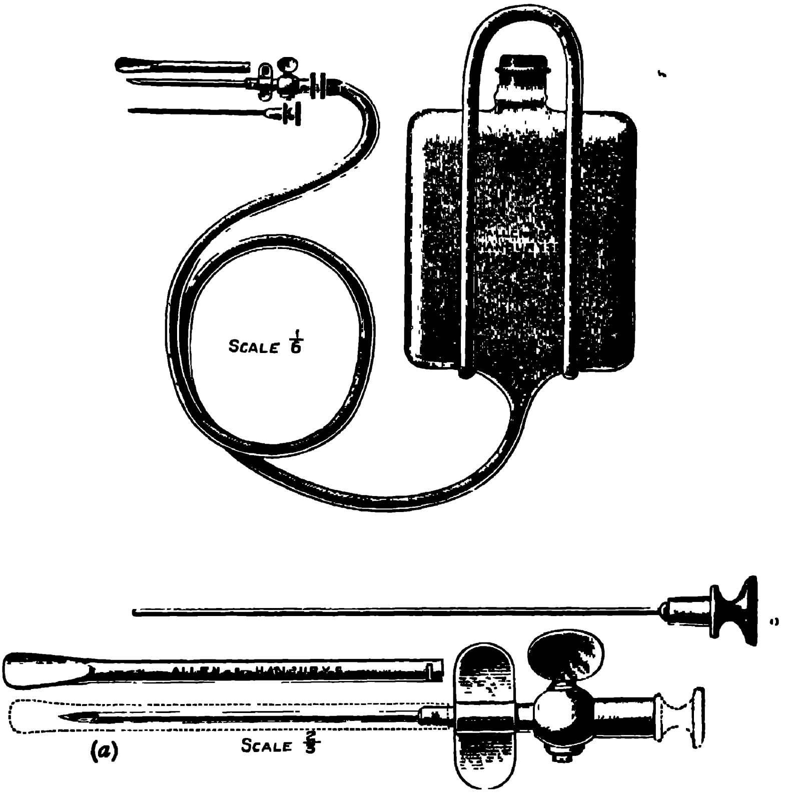

Fig. 270.—Arbuthnot Lane's Apparatus for Subcutaneous Saline Transfusion. It consists of a rubber bag and rubber tubing, with a needle furnished with a stop-cock, for subcutaneous use, shown at (*a*).

subcutaneous or intra-venous injection of saline solution; the former is the simpler method and suffices for all but the most urgent cases, for which the intra-venous method should be reserved. Reliance must be chiefly placed in the worst cases upon saline transfusion.

A convenient apparatus for subcutaneous transfusion is that shown in fig. 270, which has the great advantage that the whole of it may be readily sterilised by boiling. In the female the best place for the injection is beneath the mamma or beneath the skin covering the ribs in the axilla; half a pint can be introduced on each side, and will be rapidly absorbed. The skin must be carefully sterilised before introducing the needle; air must be completely expelled from the tubing, and the whole procedure conducted with scrupulous antiseptic precautions. The temperature of the solution in the bag should be maintained at about 100° F. In some cases shock supervenes during the course of an operation, on account of loss of blood or from prolonged manipulation; this method of subcutaneous transfusion may then with advantage be practised during the completion of the operation.

**Recurrent Hæmorrhage.**—Serious hæmorrhage in the first twenty-four hours is almost invariably due to *slipping of a ligature* which has included a large vessel, and the ovarian pedicle is the commonest seat of this accident. Increasing pallor, restlessness, air-hunger, and a rapidly rising pulse rate together form an unmistakable picture of concealed bleeding and serve to distinguish it, as has been explained, from shock. The differential diagnosis of shock and internal hæmorrhage is obviously a matter of the greatest practical importance from the standpoint of treatment. In the presence of these symptoms the abdomen must be reopened without delay, the bleeding points securely controlled, and the effused blood removed by swabbing from the peritoneal cavity. Saline transfusion, either intra-venous or subcutaneous, should be practised in severe cases, before reopening the abdomen, and one to two pints of sterile saline solution may be left in the peritoneal cavity before closing the abdominal wound. The necessity for haste must not excuse slackness in aseptic detail, for after severe hæmorrhage the power of the tissues to resist infection is greatly reduced.

Slight oozing from small bleeding points which have escaped notice in the pelvis may result in the formation of a *pelvic hæmatocele.* The amount of blood thus lost may be insufficient to produce any of the constitutional symptoms just enumerated. A rise of temperature towards the end of the first week usually results, and if the blood becomes infected from the bowel or some other source, fever may be high and accompanied by abdominal pain and distension. On vaginal examination a characteristic soft swelling will be found in the pouch of Douglas, and when infected this may burrow deeply between the rectum and the vagina, causing the upper part of the posterior vaginal wall to become prominent. The treatment in all cases is to open the posterior fornix by posterior colpotomy and drain the hæmatocele into the vagina.

**Intestinal paresis and meteorism,** though often due to peritonitis, may occur independently about the third or fourth day after operation. Inadequate preparation of the patient for the operation and extensive manipulative disturbance of the peritoneum favour its occurrence. It does not occur when free and early evacuation of the bowels has been secured, as already mentioned.

When this condition is supervening there is vomiting and increasing abdominal distension with tenderness ; the pulse rate and the temperature rise ; the patient's general condition becomes greatly distressed, the face flushed and the expression anxious. Dilatation of the stomach may also occur, large quantities of fluid, often offensive but not fæcal, being ejected intermittently, and the epigastric region being distended and tympanitic. It is of little use to give aperients by the mouth, for absorption from the stomach is to a great extent in abeyance, and the stomach contents are stagnant from loss of peristaltic movements. Large rectal enemata must be given through a long rubber tube passed for six or eight inches into the rectum ; two to three pints of soap and water with half an ounce of turpentine is the best medium to use. The enema must be repeated every two or three hours until the condition is relieved by the free passage of flatus or fæces or both. A hypodermic injection of Eserine ($\frac{1}{100}$ gr.) is also useful in stimulating peristalsis when the intestinal muscle is not entirely paralysed by over-distension. When vomiting is severe and persistent the stomach should also be washed out by the stomach tube, and a full dose of a saline aperient, such as sulphate of magnesia, then introduced through the tube.

**Peritonitis** is generally due to some fault in antiseptic technique, or to fouling of the peritoneum with pus or infected fluids during the operation, or to injury to the bowel. When the peritoneum has thus been fouled the patient should be placed in Fowler's position as early as possible to diminish the risk of infection spreading to the upper abdominal zone; free drainage should be maintained, and free evacuation of the bowels should be secured at the earliest practicable moment.

Post-operative peritonitis may assume many different forms and its recognition may present the greatest diagnostic difficulties. When *general* or *diffused* the early stages may be almost identical with those of intestinal paresis, just described, the vomited fluid being, however, generally brownish in colour; sometimes these symptoms are complicated by the appearance of fæcal odour in the vomited fluid (peritonitic obstruction). In some cases, instead of such obtrusive symptoms as these, there may at first be no symptoms beyond a slight rise of pulse and temperature, nausea and slight malaise, without distension of the abdomen, and without much vomiting; yet general suppurative peritonitis may ultimately be discovered.

The treatment of post-operative *diffused* peritonitis is by no means hopeful. If not already provided for, free drainage must of course be secured into the vagina, and also in severe cases by means of tubes introduced in the middle line above the pubes, and through the flank on each side to drain the renal pouches. If possible, the necessary incisions should be made under local anæsthesia, for chloroform or ether anæsthesia in cases of acute peritonitis aggravates vomiting, and greatly prejudices the patient's chances of recovery. The abdominal viscera should be handled as little as possible, lymph whenever it is seen should not be disturbed, and free fluid should be removed by gentle swabbing. Irrigation probably does more harm than good by diffusing infective material more widely. Apart from this, the treatment consists of careful nursing and feeding. The value of vaccines in acute sepsis is still an undecided point, and the use of this method of treatment must be left to the discretion of the individual.

*Localised* peritonitis reveals itself later than general peritonitis, and results in pain and distension limited to the pelvis or the lower abdominal zone, with a moderate rise in pulse and temperature. Abscess formation may result and such collections of pus should be evacuated as early as possible; they are generally accessible through the posterior fornix by colpotomy.

**Post-operative parotitis and phlebitis** are examples of septic metastasis. The former has become very uncommon since the elaboration of modern methods of aseptic surgery. In some cases it was traced to oral sepsis, and consequently it is advisable that carious teeth should be removed, or pyorrhœa treated before operation, if the necessary time is available. Phlebitis is more common and occurs in something like one per cent of cases. The femoral vein is the one usually attacked, and the result is œdema, pain and swelling of the affected limb, with elevation of temperature and general malaise. The treatment is prolonged rest and the avoidance of movement of the limb; this must be continued for a week after all pain has disappeared and the temperature has become normal. A certain amount of swelling of the ankle and stiffness or pain on movement may remain for several months, and are best treated by massage and the use of an elastic bandage.

**Intestinal Obstruction.**—Mechanical obstruction may occur after abdominal operations from kinking of the bowel due to adhesion of a knuckle of gut to a raw surface, to a line of stitches, or to a neighbouring knuckle; sometimes a volvulus occurs, or a loop of bowel may become constricted beneath a band of adhesion. When occurring during the first few days after operation, the differential diagnosis from intestinal paresis and from peritonitis presents great difficulty. In any case of doubt it is better to re-open the abdomen for purposes of exploration than to delay this procedure when palliative measures prove unsuccessful. It seldom occurs before the end of the first week of convalescence, when the clinical features are of course more characteristic.

**Fæcal Fistula.**—This condition may occur when dense intestinal adhesions have been dealt with at the operation, as is often the case in chronic suppurative disease of the tubes and ovaries. It is not, as a rule, until the fifth or sixth day after operation that the fistula appears. As in such cases drainage is usually practised, it is along the track of the tube that the fæcal matter escapes; the discharge is usually at first purulent with a fæcal odour, and later simply fæculent. This probably indicates that an abscess has formed in or near the wall of the damaged piece of bowel, which has communicated both with the sinus and with the interior of the gut.

The *treatment* consists in keeping the patient in bed, and restricted to light, easily-digested food. If the mouth of the sinus is kept clean and not disturbed by unnecessary probings and dressings, it will usually close spontaneously in from four to six weeks. Purgatives should be avoided, and the lower bowel kept empty with a daily enema. Occasionally the sinus persists, and in such cases it must be excised, and the opening in the bowel closed by suture, or if necessary the damaged portion excised and an intestinal anastomosis performed.

**Stitch Abscess** usually occurs within the first week of convalescence, but in exceptional cases suppuration in buried stitches of unabsorbable material, such as silk, may manifest itself months or even years after the operation. When the abscess occurs in connection with fascial stitches it may become widely diffused within the rectus sheath and at a considerable depth from the surface. The treatment is to open and drain the abscess at the earliest possible moment.

**Sudden Death.**—After recovery from anæsthesia and from shock, sudden death during convalescence may occur from pulmonary embolism or thrombosis, from profuse intraperitoneal hæmorrhage, or from cardiac failure, as in cases of valvular disease or disease of the muscular tissue of the heart. Pulmonary embolism or thrombosis sometimes occurs after abdominal operations upon persons whose circulatory and respiratory systems are free from disease, and who up to the time of death appeared to be making a smooth recovery. Death may in such cases be instantaneous, or may supervene after half an hour or an hour's struggle with the death agony. This tragical occurrence has never been adequately explained, even when an examination of the body after death has demonstrated the obstruction in the pulmonary vessel. The original embolus no doubt comes from the ligatured veins, and it is possible that the clot formed near the ligature may, in these cases, be unusually friable, allowing a portion to become spontaneously detached. Whether or not this is in any way the result of imperfect asepsis we do not know, and nothing can be done to foretell it or prevent the accident from occurring. In the majority of cases, death has occurred from this cause during the latter half of the first week, but sometimes as late as the end of the second week. It does not appear to be in any way produced by voluntary movements on the part of the patient.

# PART XV

# THERAPEUTICAL NOTES

## VAGINAL DOUCHING

There are three different purposes for which douching may be employed: (1) to remove excess of secretions or discharges; (2) to check hæmorrhage from the uterus; (3) to promote the absorption of inflammatory products.

(1) For this purpose douching is frequently employed by women who are in good health, as a part of the daily routine of cleanliness. This practice is opposed to what we know of the physiology of the vaginal secretion, and should be discouraged. Non-purulent and non-offensive secretions, even when in excess, are not harmful, and their removal by germicidal or other solution impairs the natural defences against microbic invasion from without. And further, it must be remembered that a douche carelessly administered may become a means of infection rather than of cleanliness.

Purulent, muco-purulent and hæmorrhagic discharges tend to decompose and become offensive when retained in the vagina, and are in any case irritating to the mucous membranes and the skin. The thin and offensive discharges met with in the necrotic stages of malignant growths often cause intense irritation. In such cases a douche removes accumulations from the vaginal fornices, and is most required on rising in the morning, for the recumbent position favours retention in the vagina. When vaginal pessaries are worn, a daily douche assists in preventing them from becoming fouled by adhesion of secretion to them, and should in all cases be advised.

The germicidal value of a douche, especially if administered by the patient to herself, is very small, for the upper part of the vagina is frequently very imperfectly reached by it; and in the strength of solution commonly used, it is too weak to destroy organisms by direct action, although they may be mechanically washed away by the stream of fluid.

A *non-irritating* and useful solution for use in non-infective cases is normal saline solution (ʒi of salt to O i of water); mild *antiseptic* solutions which may be employed are: boric acid ʒi to O i, or perchloride or biniodide of mercury 1/4000; carbolic acid 1/80; chinosol 1/2000; lysol, cyllin, or izal ʒi to O ii. *Astringent* solutions have been much in vogue, but the irritating effects of the prolonged use of such solutions must not be overlooked, and the astringent action is probably of little real value; mild astringents such as alum and sulphate of zinc, ʒi of each to O i, or sulpho-carbolate of zinc in the same strength may be used. All solutions used merely as vehicles for the removal of discharge should be of a moderately warm temperature, i.e., about 105°, for, this degree of warmth has little or no effect upon the condition of the pelvic blood vessels.

When *offensive* discharges are present the best antiseptics to employ are iodine, formaldehyde, or peroxide of hydrogen. The former can be used in the strength of ʒi of tincture of iodine to a pint of water; formaldehyde in the strength of ʒi of the 20 per cent. solution to a pint of water; peroxide in the strength of one part of the twenty volumes solution to three parts of water.

(2) Employed to check uterine hæmorrhage, the temperature of the fluid used is of much more importance than the nature of the solution. Unless the temperature is at the lowest 115° F. no hæmostatic effect is produced but rather the reverse; if it can be borne, the temperature should be raised to 118° F. or 120° F. This douche should be given with the patient lying down, and with special precautions against the introduction of impurities into the vagina from without. Large quantities of fluid are required if the full effect is to be obtained. The hot water excites the uterine muscle, the contraction of which temporarily diminishes the vascularity of the endometrium, and so checks bleeding from this membrane. Brought into actual contact with the bleeding surface hot water contracts the blood-vessels and so directly controls hæmorrhage; in cases of bleeding from the cervical or vaginal surface this direct effect is produced by the douche, but when the source of the bleeding is intra-uterine the

direct effect can only be produced by an intra-uterine douche. This form of douche cannot be administered without previous dilatation of the cervix, owing to the necessity of providing free exit for the fluid; accordingly its use in cases of hæmorrhage is seldom practicable.

(3) Employed in cases of chronic pelvic exudation, douching promotes absorption, probably by bringing about a slightly increased determination of blood to the pelvic organs generally. Large quantities, e.g. six or eight pints of the douche fluid, should be used, and the temperature should not be higher than 110° F. Irritating antiseptic or astringent fluids are unsuitable; normal saline solution or very weak boric acid are more suitable for this purpose.

## VAGINAL APPLICATIONS

The vaginal tampon or plug is used under two different conditions: (1) it may be used to arrest uterine hæmorrhage, when the upper part of the vaginal canal should be firmly plugged with strips of sterile gauze or other suitable materials; (2) it may be employed as a means of internal medication, when small balls of cotton wool or strips of gauze are impregnated with the desired solution, introduced into the vagina, and allowed to remain there for a period not exceeding twenty-four hours.

(1) Plugging the vagina for hæmorrhage, apart from obstetric conditions, may become necessary in fibroid or malignant tumours of the uterus, and occasionally in cases of hæmorrhage from traumatism. Unless thoroughly and efficiently applied the tampon will entirely fail to control the bleeding. The patient should be placed in the Sims's position or the modified lithotomy position, a Sims's speculum introduced and then long strips of sterile gauze, or strips of linen previously sterilised by boiling, are packed into the vaginal fornices with a long probe or a pair of long forceps. The fornices must be tightly plugged all round the cervix, which is thus gradually buried, as the gauze is packed around and below it. The lower half of the vaginal canal need be only lightly filled, or difficulty will arise in the evacuation of the bladder.

(2) Gauze or wool tampons such as that shown in fig 271

are convenient for the application of sedative, counter-irritant or antiseptic substances to the vaginal mucous membrane. The ball is soaked in the solution, passed into the vagina and carried by the finger or forceps up to the cervix and the loose tail of gauze then lightly packed beneath it, leaving the lower end protruding from the vulva so that it may be readily withdrawn. They are equally suitable for use in the consulting-room or at the bedside. The tampon should be changed every twelve to twenty-four hours; during menstruation its employment is inadvisable.

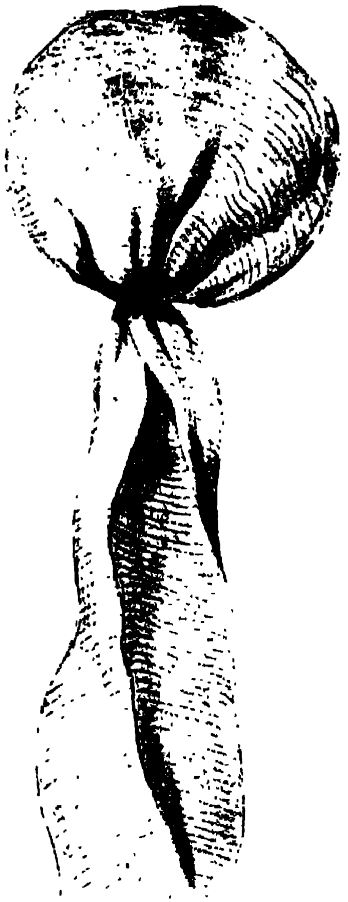

Fig. 271.—Vaginal Tampon for Local Applications.

A convenient substitute for the medicated gauze or wool tampon is the medicated *vaginal pessary*; the basis of these pessaries is either cocoa butter or a mass made of glycerine and gelatin; to this is added the drug required for medication.

The simplest form of *counter-irritant* for vaginal application is glycerine; the tampon may be soaked in this substance, or the pessary may be ordered to contain thirty per cent. to fifty per cent. of glycerine in its composition. The glycerine produces an abundant discharge of a thin watery fluid from the vagina, which probably results mainly from the powerful hygroscopic qualities of this substance. The effect of the glycerine is increased by the addition to the medicated pessary of twenty per cent. to thirty per cent. of *ichthyol*; this substance is more irritating than glycerine and sometimes causes considerable smarting pain and local discomfort.

The applications are useful in chronic inflammatory conditions; they may be combined with douching, and with the use of hot hip baths.

In chronic infective vaginitis antiseptic applications are of service, and pessaries containing five to ten grains of iodoform or half a grain of carbolic acid may be employed. Similar pessaries containing sedatives, such as one grain of opium or half a grain of cocaine, may also be used for the relief of pain in acute attacks of pelvic inflammation, in dyspareunia, etc.

*Direct applications* to the vaginal or cervical mucous membranes may also be required in chronic inflammatory conditions. Thus gonorrhœal vaginitis may be treated by exposing the vaginal walls with a Sims's speculum or a flat vaginal retractor, carefully removing discharge from the surface with cotton wool held in forceps, and then swabbing the mucous membrane with a strong solution of nitrate of silver—twenty to forty grains to an ounce, or a 2 per cent. solution of iodine. The whole of the vagina can be thus dealt with by altering the position of the speculum so as to expose each part in turn.

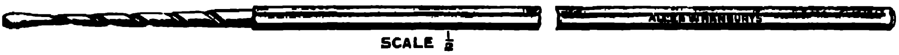

FIG. 272.—PROBE FOR INTRA-CERVICAL APPLICATIONS.

Applications to the cervical endometrium may be made in cases of gonorrhœa, of 'erosion,' or of chronic cervical catarrh. For this purpose the cervix is most conveniently exposed with a Ferguson's speculum, and the application to the canal made with a probe such as that shown in fig. 272, covered with a twist of cotton wool. The difficulty of curing cervical gonorrhœa has been already referred to. Pure carbolic acid, iodised phenol (iodine forty grains, liquefied carbolic acid one ounce) and a saturated solution of picric acid are the best applications for erosions, but only slight cases can be cured by local application of this kind (see p. 208).

## BALNEO-THERAPEUTICS

The value of the combined external and internal use of certain mineral waters is recognised in cases of chronic pelvic inflammation and other minor gynaecological conditions, especially when these are associated with neurasthenia, constipation, anæmia, gout, and other general constitutional derangements. This line of treatment is rarely successful unless carried out at a spa or health resort, where the special arrangements and appliances associated with hydro-therapeutic methods can be made. The good effect when obtained is temporary, and regular visits repeated once or twice a year for a considerable period are often required; ultimately symptomatic relief of the conditions mentioned can often be obtained. Treatment of this kind is only accessible to women of the well-to-do and leisured classes. The change of climate and surroundings, change of diet, and observance of a regular routine of life, which form an important part of a 'cure' at a spa, no doubt contribute greatly to the improvement in the general health and in the local morbid conditions.

In this country Woodhall Spa, which possesses springs containing a small proportion of bromides and iodides, is found useful, especially in cases of menorrhagia and leucorrhœa which do not arise from a new growth, and to a less extent in cases of chronic inflammatory disease of the adnexa or the pelvic peritoneum. Salzo Maggiore in Northern Italy and Kreuznach in Germany are spas possessing waters of a similar character. Ferruginous, saline, or aperient waters are to be found in many resorts both in this country and abroad, and should be selected in preference to the above, when constitutional derangements form a factor of considerable importance in the case.

# INDEX

A

Abdomen
  cause of general enlargement of, 88
  examination of, 85
  palpation of, 85
  'phantom' enlargement of, 88
Acetone in treatment of cancer, 305
Actinomycosis of the female genital organs, 449
Adeno-carcinoma
  of cervix, 283
  of ovary, 350
  of uterine body, 299
  of vulva, 512
Adeno-carcinoma papillare, 350
Adolescence, hæmorrhage in, 110
Adult life, ovary in, 44
After-treatment of major operations, 605
After-treatment of major operations, complicated by:
  fæcal fistula, 612
  intestinal obstruction, 612
  intestinal paresis and meteorism, 610
  pelvic hæmatocele, 610
  peritonitis, 611
  post-operative parotitis and phlebitis, 612
  recurrent hæmorrhage, 609
  shock, 607
  slipping of a ligature, 609
  stitch abscess, 613
  sudden death, 613
After-treatment of major operations in uncomplicated cases, 605
Alexander-Adams's operation, 566
Amenorrhœa, 127, 158
  pathological, 127
  physiological, 127
  primary, causes of, 127
  secondary, causes of, 128, 134
  general treatment, 136
Amputation of cervix, 580
Anatomy and physiology of female genital organs, 1
Anatomy
  of female pelvic cavity, 1, 5
  of menstruation, 73
Anteflexion of uterus, treatment, 155
Appendicitis as cause of infection of tube and ovary of right side, 401
Arbor vitae uterina, 14
Arteries or Artery
  cervical, circular of cervix, 61
  ovarian, 59
  pudic, 62
  to bulb, 62
  to clitoris, 62
  uterine, 60
  vaginal, 62
Ascites, 88
Atmokausis for reducing hæmorrhage, 115
Atresia
  congenital vaginal, 133
  superficial vulval, 193
Aveling's repositor for chronic inversion, 187
Azygos artery of vagina, 62

B

Balneo-therapeutics, 620
Bartholin, duct of,
  cysts, 513
  glands of, 57
  inflammation of, 515
  symptoms and treatment, 515, 516
Bell (Blair), chemical composition of menstrual discharge, 75
Bladder
  lateral ligaments of, 6
  transverse fold of, 6
Blood casts of uterus, 213
Blood-vessels, pelvic, 59
Bulb, artery of, 62
  vaginal, 62

C

Cancer of body of uterus, 296
  adeno-carcinoma, alveolar and tubular, 299
  and fibroid tumours, 259
  and parity, 301
  clinical features, 301
  diagnosis, 303
  microscopic appearances, 299
  pathological anatomy, 296
  spread of, 300
  symptoms, 301
Cancer of cervix, 275
  adeno-carcinoma, 276
  and fibroid tumours, 259
  and menopause, 288
  and parity, 287
  clinical features, 287
  diagnosis of operability, 294
  duration and prognosis, 295
  endocervical, 278, 291
  epithelioma, 276
  formative or proliferative, 277
  involving other pelvic organs, 293
  microscopic appearances, 280
  panhysterectomy for, 553
  pathological anatomy, 275
  spread of, 286
  squamous-celled, 276
  symptoms, 288
  symptoms of advanced stages, 292
  tubular, 286
  ulcerative or eroding, 277
  Wertheim's operation for, 553
Cancer of ovary, 344
  dissemination of, 347
  papillary or adeno-carcinoma papillare, 350
  primary, 344
  secondary, 354
Cancer of uterus
  palliative operation for, 304
  prognosis, 304
  statistics, 274
  treatment, 303
  Wertheim's operation, 304
Cancerous metaplasia in a benign ovarian tumour, 349
Carcinoma of urethra
  primary and secondary, 521
  treatment, 522
Carcinoma of vagina
  primary and secondary, 489
  symptoms, 489
Carmichael and Marshall's results of removal of ovaries in rodents, 46
Carunculae myrtiformes, 57
Cellular tissue, 8
  distribution and relations of, 8, 9
  inflammation of, 419
Cellulitis, pelvic, 420
Cervix uteri, 11, 12, 13
  cancer of. See *Cancer*
  chancre of, 291
  circular artery of, 61
  conical, and small os externum, 529
  dilatation of, 569
  hæmorrhage from, 107
  plastic operations on, 579
  stenosis of, 214
  supra-vaginal, 12, 13
  transverse ligaments of, 148
  tuberculous disease of, 291
Chancre
  of cervix, 291
  of vulva, 506
Child-bearing, uterus after, 27
Childhood,
  hæmorrhage in, 110
  ovary in, 44
Chlorosis, 134
Chorion-epithelioma
  diagnosis, 318
  pathological anatomy, 312
  symptoms, 316
  treatment, 318
Circulatory changes in fibroid tumours, 256
Climacteric period, see *Menopause*
Clitoris,
  artery to, 62
  prepuce of, 51, 54
Cloaca, 69
  membrane of, 69
Coitus,
  difficult, 122
  painful, 122
Colpo-perineorrhaphy for prolapse, 183
Colporrhaphy
  anterior, 183, 595
  indications, 595
  posterior, 599
Colpotomy
  anterior, 10, 601
  posterior, 10, 599
Conception, retention of products of, 208
Congenital abnormalities of ovaries and Fallopian tubes, 530
Cords of Kölliker, 36
Cornua of uterus, 11, 13
Corpus fibrosum or corpus albicans, 42
Corpus luteum, 41, 78
Counter-irritant for vaginal application, 618

Curetting, 574
    for fibroid tumours, 267
Cutaneous nævi of vulva, 509
Cystic ovaries, 327
Cyst or cysts, Bartholinian, 513
    symptoms and treatment, 515
Cyst of ovary
    cyst-adenoma, 330
    cyst-adenoma pseudomucinosum invertens, 338
    colloid, 336
    corpus luteum, 328
    'daughter' cysts, 336
    dermoid, 360
    follicular, 327
    lutein, 43
    papilliferous or papillary, 338
    proliferating multilocular or pseudomucinous, 330, 352
    racemose, 343
    serous cyst-adenoma, 337
Cyst of parovarium, 367
    Gartner's duct, 367, 371
Cyst of parovarium and ovarian cysts, distinction between, 371
Cystocele, 174
    operative treatment of, 595
Cystocele and vaginal cysts, 487

D

Death, sudden after operations, 613
Degenerations in fibroid tumours, 248
    cystic, 253
    fatty and calcareous, 249
    myxomatous or hyaline, 251
    necrosis or necrobiosis (red degeneration), 249
Dermoid cysts
    of ovary, 360
    etiology of, 365
    of vulva, 509
Development of female genital organs, 67
Diaphragm, pelvic, 148
Dietl's crises, 119
Digital examination of vagina, 91
Dilatation of cervix uteri, 569
    as a preliminary to curetting, 569
    for spasmodic dysmenorrhœa, 569
    to establish drainage in pyometra or purulent endometritis, 569
Dilators, cervical, 572
Discharges
    examination of, 105
    from vagina, 115
    offensive, 117
Discharges—*continued*
    purulent and muco-purulent, 116
    thin, serous or watery-coloured, 117
    treatment, 117
Displacements
    of ovary. See *Ovary*
    of uterus. See *Uterus*
Disturbances of micturition, 119
Döderlein, Scheiden Bacillus, 50
Doran (Alban), on primary cancer of Fallopian tubes, 380
Douglas, pouch of, 7
Drugs employed in arresting uterine hæmorrhage, 112
Duct or Ducts
    Mullerian, 68
    of Gartner, 68
    Wolffian, 68
Duncan (Matthews)
    rule regarding sterility, 124
    varieties of dysmenorrhœa, 137
Duration of menstruation, 72
Dysmenorrhœa, 136, 158
    causes, 137
    congestive, 137, 139, 143
    membranous, 210
    spasmodic, 137, 139, 141
Dyspareunia, 122, 158
    local causes of, 123
    treatment, 123

E

Ectropion, cervical, 200
Eczema of vulva, 501
Elephantiasis of vulva, 507
Elongation
    of the supra-vaginal cervix, 170
    treatment, 192
    vaginal cervix, 189
Endometritis, 192
    acute, 194
    cervical, 195, 200, 206
    chronic infective, 194
    chronic non-infective, 195
    corporeal, 195
    diagnosis, 207
    exfoliative, 210
    exfoliative acute, 212
    'fungous' (Olshausen), 199
    glandular, 192, 196
    interstitial, 192, 198
    microscopic appearances, 201
    pathology of, 192
    senile, 81, 213
    symptoms and treatment, 206, 213
Endometrium, 11
    arrangement of, 14
    cervical, 14

- Endometrium—*continued*
  - hæmorrhage from, 108
  - inflammation of, 192
  - structure of, 16
- Endothelioma
  - of ovary, 358
  - of uterus, 311
- Englemann's observations on menstruation, 72
- Enlargement of abdomen, causes of, 88
- Enuresis, nocturnal, 122
- Epithelioma
  - of cervix, 280
  - of dermoids, 354
  - of uterine body, 300
  - of vulva, 509
- Epithelium, germinal, 35
- Erosion
  - cervical, 19, 157
  - histology (Ruge and Veit), 202
  - papillary, 202
- Esthiomène or genito-anal scleroma, 506
- Examination
  - abdominal, 85
  - bimanual, of pelvic organs, 92
  - digital, of vagina, 91
  - methods of, 83
  - of discharges, tissues, etc., 105
  - of the urinary system, 106
  - of urine in dysuria, 120
  - rectal, recto-abdominal, and recto-vagino-abdominal, 96
  - vaginal, 90, 97
- Extra-peritoneal operation for shortening the round ligaments, 566

F

- Fallopian tube or tubes
  - anatomy, 28
  - carcinoma of, 396
  - congenital abnormalities, 395, 530
  - fistulae of, 416
  - inflammation of, 395, 405
  - interstitial or uterine portion, 28
  - morbid conditions of, 395
  - new growths in, 395
  - papilloma of, 400
  - position of, 23, 28
  - pregnancy, extra-uterine in, 395
  - primary cancer of, 398
  - rupture of, 455, 461, 463
  - structure, 30
  - tumours of, 396
- Fallopian tube or tubes—*continued*
  - and ovaries, tuberculous disease of, 445
  - See also *Hæmatosalpinx*, *Hydrosalpinx*, *Pyosalpinx*, and *Sactosalpinx*
- Ferguson's speculum, 98
  - method of introducing, 99
- Fibroid Tumours
  - abdominal hysterectomy for, 548
  - removed by myomectomy, 556
  - See also *Tumours*, fibroid
- Fibroma of ovary, 355
  - circumscribed, 355
  - diffused, 356
  - structure, 356
- Fibroma of vulva, 509
- Fibrosis uteri, 215
- Fissures of vulva, 505
- Fistula or Fistulae
  - fæcal, complicating after-treatment in major operations, 612
  - tubal, 416
  - tubo-appendicular, 404
  - tubo-ovarian, 417
  - ureteral, 492
  - urinary vaginal, 491
  - vesico-vaginal, 491, 579
- Flushing curette, 575
- Fœtus, uterus of, 26
- Folds
  - genital, 70
  - infundibulo-pelvic, 23
- Follicular
  - cysts, 327
  - epithelium, 326
  - ulcers of vulva, 505
- Fossa or fossae
  - navicularis of vulva, 56
  - pararectal, 7, 8
  - paravesical, 6
- Fourchette, 53
- Frankel's theory of ovulation and menstruation, 78
- Frenulum, 54
- Fundus of uterus, 11

G

- Gartner, duct of, 45, 68
  - cysts of, 367, 371
- Gautier and Douser, chemical composition of menstrual discharge, 75
- Gebhard on pathology of endometritis, 192
- Gellhorn, use of acetone in cancer, 305
- Genital
  - cord, 69
  - folds, 70
  - papilla, 70

Genital organs, female
    anatomy and physiology of, 1
    development of, 67
Genital tract, female
    gonorrhœal infection of, 436
    tuberculous disease of, 444
Genito-anal scleroma, 506
Germ epithelium, 35, 67, 326
Gestation, extra-uterine (ectopic), 451
    See also *Pregnancy*, extra-uterine.
Gilliam's operation for shortening the round ligaments, 567
Glands
    of Bartholin, 57
    genital, 67
    lymphatic, 63
    superficial inguinal, 64
    uterine, 17, 19, 20
Glans clitoridis, 51, 56
Gonorrhœa and vaginitis, 483
Gonorrhœal infection of female genital tract, 436
    clinical features, 437
    diagnosis, 441
    local and general treatment, 442
    symptoms, 440
    vaginitis, 438
    vulvitis, 438
Graafian follicles, 35
    ripening of, 39
    rupture and repair of, 41
    structure, 37
Grafting of ovary, autoplastic and heteroplastic, 47.
Gynaecological disease
    significance of pain in, 118
    symptoms of, 84, 107
Gynaecological operations, major, 533
    general conduct of, 536
    instruments and ligatures, 535
    preparation of patient, 533
    swabs and compresses, 535
    technique, 533
Gynaecological operations, minor, 569

H

Hæmatocele, pelvic, 474
    after major operations, 610
    differential diagnosis, 474
    and pelvic peritonitis, 476
Hæmatocolpos, 130
Hæmatoma of ovary, 324
Hæmatometra
    causes of, 319
    clinical features, 320
    treatment, 320
Hæmatosalpinx, 411
Hæmorrhage, uterine, 107, 108, 310
    at menopause, 82, 111
    drugs employed in arresting, 112
    from fibroid tumours, 241, 266
    in adolescence, 110
    in childhood, 110
    in infancy, 110
    in period of reproductive activity, 110
    in post-climacteric period, 111
    internal in tubal pregnancy, 408
    into ovary, 324
    recurrent, after major operations, 609
    treatment, 112
Hæmostatics, uterine, 113
Hermaphroditism, 530
Hernia
    inguinal or labial, 513
    of ovary, 324
    of uterus, 152
Hindgut, 70
Hitschmann and Adler
    on pathology of endometritis, 193
    on structure of endometrium, 20
Hodge pessary, 164
Hot douching for reducing hæmorrhage, 114
Hydatid of Morgagni, 45
Hydrops folliculorum, 327
Hydrosalpinx, 410
    etiology of, 412
    intermittent, 415
Hymen, 56
    cribriform, 56
    development of, 71
    imperforate, 56, 130, 132, 133
Hysterectomy
    abdominal, for fibroid tumours, 548
    supra-vaginal, for fibroid tumours, 268
    supra-vaginal or sub-total, 549
    vaginal, 558
    total. See *Panhysterectomy*
Hysterocele, 152

I

Imperforate hymen, 130
    clinical features, 132
    treatment, 133
Incontinence of urine, 122
    treatment, 122
Infancy, uterine hæmorrhage in, 110
Infection of fibroid tumours, 257
Inflammation
    of Fallopian tubes and ovary, 48, 405, 426

Inflammation—*continued*
    of ovary, 325
    of pelvic peritoneum and cellular tissue, 419
    of upper portion of genital tract, 401
    See also *Pelvic* inflammation.
Insertion, cervico-vaginal, 26
Instruments and ligatures in major gynaecological operations, 535
Intestinal obstruction
    complicating after-treatment in major operations, 612
    consequent on fibroid tumours, 244
Intestinal paresis and meteorism complicating after-treatment in major operations, 610
Intraperitoneal operation for shortening the round ligaments, 566
Itching of vulva, 500

K

Keith's theory of development from pronephros, 68
Kelly and Cullen, statistics of cancer and sarcoma associated with fibroid tumours, 260
Kölliker, cords of, 36
Kraurosis of vulva, 502
Kreuznach waters, 620

L

Labia
    majora, 51
    minora or nymphae, 53
Labial hernia, 513
Lacerations
    perineal, 516, 587
    vaginal, 491
Leucoplakia of vulva, 501
Leucorrhœa, 116
    consequent on fibroid tumours, 243
Ligaments of cervix, transverse, 25, 148
Ligaments of ovary, 23, 33
Ligaments of uterus, 22
    broad, 22
    round, 22, 24
    utero-sacral, 22, 25
    utero-vesical, 6
Ligatures, 535
Lipoma of vulva, 509
Lithopaedion, prolonged retention of, 478
Lutein cells, origin of, 41
Lymphatics of pelvis, 59, 63
    course of, 63
    involved in
        cancer of body, 300
        cancer of cervix, 287

M

Malformation or malformations of uterus, 523
    uterus bicornis bicollis, 524
    uterus bicornis unicollis, 525
    conical cervix and small os externum, 529
    rudimentary, 523
    uterus didelphys, 523
    uterus infantilis, 523
    uterus septus, 526
    uterus subseptus, 526
    uterus unicornis, 527
Malformation or malformations of vagina, 523
Malignant ulcer in vulva, 506
Medullary cords of Kölliker, 326
Melanoma of vulva, 512
Membrana granulosa of Graafian follicles, 39
Menopause, 79, 82
    anatomical changes after, 81
    and cancer of cervix, 288
    artificial, 46, 80
    discharges at, 82
    hæmorrhage at, 82, 111
    premature, 80
    uterus after, 28
Menorrhagia, 158
Menstrual discharge, chemical composition of, 75
Menstruation, 71
    anatomy of, 73
    average periodicity, 72
    causation, 76
    cessation, 79
    changes in endometrium during, 74
    changes in pelvic organs during, 74
    disorders of, 127
    duration of, 71, 72
    effect of climate and other factors on, 72
    Englemann's observations on, 72
    general management of, 79
    mechanism of, 74
    precocious, 72
    retained, 130
    symptoms, 75
    time of onset in United States of America, 71
Mesometrium, 24
Mesonephros, 67

- Mesosalpinx, position of, 23, 44
- Metritis
  - acute, 194
  - chronic, 215
  - clinical diagnosis, 217
  - clinical features, 215
  - from gonorrhœal infection, 439
  - pathology, 216
  - treatment, 217
- Micturition
  - disturbances of, 119
  - pain and frequency of, 120
- Mittelschmerz, 144
  - causation, 145
- Molimina, menstrual, 135
- Mons Veneris, 51
- Morgagni, hydatid of, 45
  - membranous dysmenorrhœa, 210
- Müller, duct of, 68
- Musculature of uterus, 22
- Myomectomy for fibroid tumours, 268, 556

N

- Nacke's case of precocious menstruation, 72
- Necrosis or Necrobiosis in fibroid tumours, 249
- Nerves, pelvic, 59, 66
- Neuralgia of ovary, 321
- Noble, statistics of cancer and sarcoma associated with fibroid tumours, 260
- Noma pudendi, 403

O

- Obesity, 88
- Oöphoritis, interstitial, 417
- Operability of cancer of cervix, diagnosis, 294
- Organ of Rosenmuller, 44
- Os externum, 11, 13
  - small, with conical cervix, 529
- Ostium or introitus vaginae, 56
- ' Ovarian facies,' 380
- Ovarian pedicle, 337
- Ovaries or ovary
  - at different periods of life, 44
  - autoplastic and heteroplastic grafting of, 47
  - cancer of, 344, 347, 354
  - cancerous metaplasia in a benign tumour of, 349
  - congenital abnormalities of, 350
  - connective tissue tumours of, 355
  - cystic, 327
- Ovaries or ovary *continued*
  - cysts of, 326
  - cysts of, and parovarian cysts, 371
  - description and general characters of, 33
  - development, 67
  - displacements of, 322
  - endothelioma of, 358
  - fibroma of, 355
  - Graafian follicles of, 35, 36
  - hæmatoma of, 324
  - hæmorrhage into, 324
  - hernia of, 324
  - histology, 35
  - in adult life, 44
  - in childhood, 44
  - inflammation of, 325, 405, 417
  - in old age, 44
  - in rodents, results of removal of, 46
  - internal secretion of, 46
  - ligament of, 23, 33
  - neuralgia in, 321
  - physiology of, 45
  - position, 34, 35
  - prolapse, 322
  - sarcoma of, 356
  - stroma of, 36
  - teratoma of, 360, 365
  - tunica albuginea, 35
- Ovariotomy, 541
- Ovula of Naboth, 19, 204
- Ovulation and Menstruation, 77
  - Fraenkel's theory on, 78
  - Stevenson's theory on, 78
- Ovulation, histology of, 45
  - process of, 45

P

- Pain
  - and frequency of micturition, 121
  - from fibroid tumours, 242, 266
  - in backward displacement, 158
  - in gynaecology, 118
  - intermenstrual, 144
- Palpation, abdominal, 85
- Panhysterectomy
  - for cancer of cervix, 553
  - for fibroid tumours, 549, 551
  - for malignant disease, 552
- Papilla, genital, 70
- Papilloma
  - of Fallopian tube, 396
  - of ovary, 343
  - of vulva, 509
- Parametritis, 420
- Parity and cancer
  - of body of uterus, 301
  - of cervix, 287

Parovarium, 44
    cysts of, 367
Pelvic cellulitis, 420
Pelvic diaphragm, 149
Pelvic inflammation, 401
    acute, 433
    ascending, 402
    chronic, 433
    diagnosis, 423
    differential diagnosis, 431
    etiology, 402
    general symptoms, 423, 425
    treatment, 433, 435
    tubo-ovarian, watering-places for palliative treatment, 434
Pelvic organs
    bimanual examination of, 92
    changes in coincident with fibroids, 236
Pelvic peritoneum
    inflammation of, 419
    diagnosis, 423
Pelvic peritonitis, 421
    acute, effusions, 430
Pelvis, female anterior and posterior compartments of, 6
    arteries of, 59
    general anatomy of cavity of, 1, 5
    lymphatics and nerves of, 59
Perimetritis, 421
Perineal injuries, 516
Perineorrhaphy, 587
    for complete laceration, 589
    for prolapse, 183
Perineum, body of, 57
Periodicity of menstruation, 72
Peri-oophoritis, 417
Perithelioma of uterus, 311
Peritoneum
    anterior and posterior pouches of, 10
    cavity of, 10
    pelvic, 4
Peritonitis after major operations, 611
    pelvic, 421
Pessaries, 178
    cradle, Hodge, Napier, Ring, Zwancke, 181, 182
    for backward displacement, 164
Pflüger's views on causation of menstruation, 77
'Phantom' enlargement of abdomen, 88
Phillips's case of sarcoma in a fœtus, 310
Physiology of female genital organs, 1
Plastic operations
    for repair of perineal lacerations, 587
    on cervix and vagina, 579
Plastic operations—*continued*
    amputation of cervix, 580
    trachelorrhaphy, 579
    vesico-vaginal fistula, 583
Plica gubernatrix, 67
Plugging for controlling hæmorrhage, 114
    cervical, 577
Polypi
    fibroid, 269, 272, 577
    malignant, 272
    mucous or adenomatous, 269, 577
    placental, 272
    uterine, 269, 273, 577
Portio vaginalis of cervix, 12, 13
Post-climacteric period, hæmorrhage in, 111
Post-operative parotitis and phlebitis after major operations, 612
Pouch
    anterior and posterior peritoneal, relations of, 10
    lateral vesical, 6
    of Douglas, 4, 7
    utero-vesical, 4
Pregnancy
    complicated by fibroid tumours, 262
        clinical course, 263
        diagnosis, 262
        management, 263
    complicated by ovarian tumours, 392
Pregnancy, extra-uterine (tubal), 411, 452
    anatomy, 453
    after occurrence of internal bleeding, 468
    before gestation is interrupted, 466
    diagnosis of internal hæmorrhage, 471, 473
    in secondary abdominal pregnancy, 477
    types of internal hæmorrhage, 468
Pregnancy, extra-uterine (Ovarian), 41, 451
Pregnancy, extra-uterine
    unruptured, treatment, 478
    with encysted internal hæmorrhage, treatment, 479
    with internal hæmorrhage of diffused type, 478
Pregnancy
    secondary abdominal and tubal pregnancy, clinical diagnosis, 477, 480
    secondary abdominal intraligamentary, 464
    intraperitoneal, 464
    primary peritoneal, 451

Preparation of patient in major gynaecological operations, 533
  for vaginal operation, 540
Preputium, 54
Pressure symptoms consequent on fibroid tumours, 243, 266
Previous history, importance of, 83
Procidentia uteri, 169
Profound anæmia consequent on fibroid tumours, 245
Prolapse
  of anterior vaginal wall and bladder, 174
  of ovary, 322
  of posterior vaginal wall and rectum, 175
  of urethral mucous membrane, 519
  of uterus, 168, 175, 183
Pronephros, 68
Pruritus of vulva, 500
  causes, 500
  treatment, 503
Pseudohermaphroditism, 530
Puberty, 27, 72
Pudic artery, 62
Pyometra, 158, 214
  causes, 319
  treatment, 320
Pyosalpinx, 410
  acute, posterior colpotomy for, 435
  chronic, treatment, 436

R

Rectocele, 175
Regions of abdominal zones, 87
Retention of urine, causes of, 121
Retro-peritoneal operation
  for shortening the round ligaments, 567
  for fibroid tumours, 226
Retroversion and retroflexion, 155
Retroversion of gravid uterus and pelvic hæmatocele, differential diagnosis, 475
Rodent ulcer in vulva, 506
Rosenmuller, organ of, 44
Round ligaments, 24
  shortening, for displacement, 566
Ruge on pathology of endometritis, 192
Ruge and Veit on histology of erosion, 202
Rupture
  of ovarian cyst, 375
  of perineum, 595
  of pyosalpinx, 416
  of tubal pregnancy, 461

S

Sactosalpinx, 410
  rupture of, 410
Salpingo-oöphorectomy, 544
Salpingo-oophoritis, 405
Salpingostomy, 436
Salzo Maggiore, waters of, 620
Sarcoma and fibroid tumours, 259
Sarcoma botryoides, 307
Sarcoma of ovary, 356
  round-celled, 358
  spindle-celled, 358
Sarcoma of uterus, 306
  clinical features, 310
  chondro-sarcoma, 310
  of endometrium, 306
  in a fœtus (Phillips), 310
  lipo-sarcoma, 310
  microscopic characters, 307
  myosarcoma, 310
  osteo-sarcoma, 310
  spread of, 310
  statistics, 311
  symptoms, 311
  treatment, 311
  vesicular, 307
  of wall, 306
Sarcoma of vagina, 490
Sarcoma of vulva, 512
Scheiden Bacillus of Döderlein, 50
Secondary changes
  in fibroid tumours, 248
  in ovarian tumours, 372
Secretion
  Bartholinian, 115
  cervical, 19, 115
  ovarian, internal, 46, 77
  uterine, 18
  vaginal, 50, 81
Segment, lower uterine, 15
Shock, complicating after-treatment in major operations, 607
Shortening the round ligament, 566
  Alexander Adams's operation (extra-peritoneal), 566
  intra-peritoneal operation, 566
  retro-peritoneal (Gilliam's) operation, 567
Sims's
  position, 100
  speculum, method of introducing, 100
Sinus, urogenital, 69
Skene's tubules, 59
Solutions for vaginal douching, 616
Sound, uterine, 102
  methods of introduction, 102
Speculum
  duck-bill, 98
  Ferguson's, 98

Speculum—*continued*
  Sims's, 98
  tubular, 97
  method of introducing, 99
Squamous-celled cancer of vulva, 509
Stenosis of the cervix, 214
Sterility, 124, 158
  absolute, 124
  causation of, 124
  relative, 124
  rule formulated by Matthews Duncan on, 124
  treatment, 125
Stevenson's theory on ovulation and menstruation, 78
Stitch abscess complicating after-treatment in major operations, 613
Subinvolution and retention of products of conception, 208
  diagnosis and symptoms, 209
  treatment, 210
Sudden death following major operations, 613
Supports, normal uterine, 147
Supra-vaginal cervix, 13
  elongation of, 190
  treatment, 192
Swabs and compresses in major gynaecological operations, 535
Symptomatology of gynaecological disease, 84

T

Technique of major gynaecological operations, 533
Teratoma of ovary, 360, 365
  histogenesis, 365
Tertiary syphilitic ulceration of vulva, 506
Therapeutical notes, 615
Tissues, examination of, 105
Tracey, statistics of cancer and sarcoma in fibroid tumours, 260
Trachelorrhaphy, 579
Tubal abortion, 455, 460
Tubal mole, 455
Tubal pregnancy. See *Pregnancy*, extra-uterine (tubal).
Tuberculous disease
  of cervix, 291
  of female genital tract, 444
  of uterine adnexa, 445
  of uterus, 447
  of vagina and vulva, 448, 505
Tubules, cords of Kölliker, 36
Tumours
  causing general enlargement of abdomen, 88
  connective tissue, 355
  See also *Ovary*
  of Fallopian tubes. See *Fallopian Tubes*
Tumours of ovary, 325
  adhesions in, 377
  axial rotation in, 372, 390
  benign cystic, 378
  benign solid, 387
  clinical features, 378, 390
  compound, 366
  degeneration cysts in solid, 378
  diagnosis, 383, 390
  fibro-adenoma, 367
  fibro-myoma, 367
  fibro-myo-sarcoma, 367
  fibro-sarcoma, 367
  infection of, 374
  inflammation and infection, 391
  malignant, 378, 388
  pathological anatomy, 326
  physical signs, 380
  and pregnancy, 392
  rupture, 375
  secondary changes in, 372
  torsion of the pedicle, 372
  treatment, 393
  See also *Ovary*
Tumours of uterus
  chondro-sarcoma, 310
  chorionepithelioma, 312
  endothelioma, 311
  lipo-sarcoma, 310
  myo-sarcoma, 310
  osteo-sarcoma, 310
  perithelioma, 311
  sarcoma, 306
Tumours of uterus (fibroid)
  adenomyoma, 224, 237
  and malignant disease of uterus, 259
  and pregnancy, 262
  cervical, 231
  circulatory changes in, 256
  clinical features, 240
  coincident changes in, 236
  cystic, 253
  degenerations in, 248
  fibro-myoma, 221
  general course and duration, 264
  general pathological anatomy, 218
  incarcerated, 246
  infection of, 257
  interstitial, 219, 227
  interstitial cervical, 232
  microscopic appearances, 220
  myomata, 220

Tumours of uterus (fibroid)—*continued*
  physical diagnosis, 245
  retro-peritoneal, 226
  secondary changes in, 248
  submucous, 219, 227
  subperitoneal, 219, 224
  subperitoneal cervical, 234
  surgical treatment, 267
  symptoms, 240
  telangiectatic, 224
  treatment, 265
Tunica Albuginea, 35

U

Ulceration of vagina, 486
Ulceration of vulva, 505
  chancre, 506
  fissures, 505
  follicular ulcers, 505
  malignant ulcer, 506
  rodent ulcer, 506
  tertiary syphilide, 506
  tuberculous ulcer, 505
Urethra, 518
  anatomy of, 58
  carcinoma of, 521
  prolapse of mucous membrane, 519
  structure of, 58
Urethral caruncles, 518
  symptoms and treatment, 519
Urinary system, examination of, 106
Urine, incontinence of, 122
  treatment, 122
  examination of, in dysuria, 120
  retention of, 121
Urogenital sinus, 69
Uterine adnexa
  operations on, 543
  oöphorectomy, 543
  salpingectomy, 547
  salpingo-oöphorectomy, 544
  salpingostomy, 547
  tuberculous disease of, 445
Uterine casts, 211, 213
Uterine polarity, 231
Uterine prolapse, 152. See also *Prolapse* and *Uterus*
Uterine sound, method of introducing, 102
Uterus
  after childbearing, 27
  after the menopause, 28
  anatomy, dimensions and shape of, 11
  arbor vitæ of, 14
  at different periods of life, 26
  at puberty, 27
  attachments of, 22
  bicornis bicollis, 524
Uterus—*continued*
  bicornis unicollis, 525
  body, cervix, fundus of, 11, 12, 13
  cancer of. See *Cancer*
  chorionepithelioma of, 312
  'decidual reaction' of (Webster), 454
  didelphys, 523
  double, 523
  hæmorrhage from, 107, 319
  hernia of, 152
  infantilis, 523
  in fœtus, 26
  malformations of, 523
  malignant disease of, and fibroid tumours, 259, 274
  morbid conditions of, 147
  musculature of, 22
  normal supports of, 147
  polypi of, 269, 273, 274
  position of normal, 15
  prolapse of, 152, 168, 175, 177, 183
  pus in, 158, 214, 310, 320
  rudimentary, 523
  sarcoma of. See *Sarcoma* and *Tumours*
  septus and subseptus, 526
  tuberculous disease of, 447
  tumours of. See *Tumours*
  unicornis, 527
  vaginal fixation of, 603
Uterus, displacements of, 147
  anteflexion, 152, 153, 154
  ante-position, 152
  anteversion, 154
  backward, operations for fixation in position of anteversion, 563
  chronic inversion, 184, 187
  elevation, 152
  hysterocele, 152
  irreducible, 168
  lateriversion, 152
  retroflexion or retroversion, 152, 155, 157, 159, 164
  retro-position, 152
  rotation, 152
  sinistro- or dextro-position, 152

V

Vagina
  anatomy of, 48
  azygos artery of, 62
  bulbs of, 62
  carcinoma of, 489
  congenital atresia of, 133
  elongation of cervix of, 189
  cysts of, 487
  digital examination of, 91

Vagina—*continued*
  discharges from, 115
  examination of, 90
  fibroids of, 487
  fornices of, 48
  injuries to, 490
  laceration of, 490
  malformations of, 523
  median column of, 48
  new growths of, 480
  orifice of, 56
  os externum, 11
  plastic operations on, 579
  preparations for operation on, 540
  prolapse of anterior wall and bladder, 174
  prolapse of posterior wall and rectum, 175
  sarcoma of, 490
  secretion of, 50
  structure of, 49
  ulceration of, 486
Vagina and vulva
  morbid conditions of, 483
  tuberculous disease of, 448
Vaginal applications, 617, 619
  douching, 615
  fixation of uterus, 603
  pessary, 618
  tampons or plugs, 617
Vaginismus, 57, 496
  treatment, 497
Vaginitis
  acute, 485
  catarrhal, 483
  chronic, 485
  diphtheritic, 484
  emphysematous, 485
  senile, 81, 484
  septic, 485
  symptoms and treatment, 485
  and gonorrhœa, 483
Vasomotor
  disturbances of menopause, 76
  of menstruation, 76
Ventrifixation or hysteropexy 563
Version or flexion, 152
Vestibule, 55
Viscera, pelvic, 11
Visual examination of vaginal walls and cervix, 97
Virchow's telangiectatic fibroid, 224
Vulva
  anatomy of, 51
  development of, 69
  eczema of, 501
  elephantiasis of, 507
  leucoplakia of, 501
  kraurosis of, 502
  malignant growths of, 509
  new growths of, 509
  position for inspection of, 91
  pruritus of, 500
  superficial atresia of, 493
  ulceration, of, 505
Vulvitis, 492
  aphthous, 493
  gangrenous, 493
  gonorrhœal, 492
  leucoplakic, 501
  thrush, 493

W

Waldeyer's germ epithelium, 35, 67, 326
Wertheim's operation for cancer
  of cervix, 553
  of uterus, 304
Wolffian
  body, 67
  duct, 68
Woodall Spa, 620

Z

Zones of pelvi-abdominal cavity, 87

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